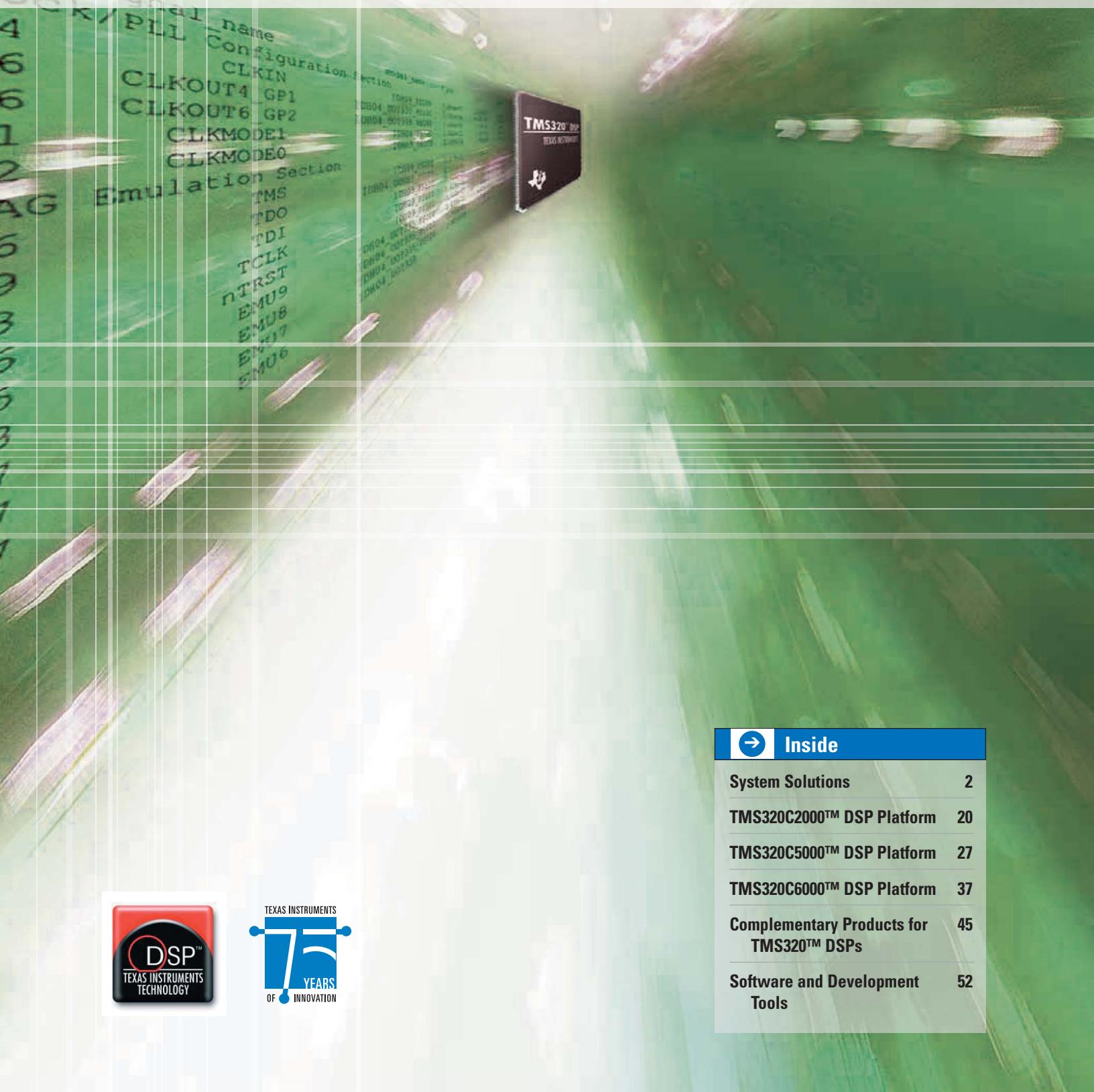


# DSP Selection Guide

Digital Signal Processors, OMAP™ Processors, System Solutions, Development Tools

2Q 2005



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**TI Worldwide Technical Support****Internet****TI Semiconductor Product Information Center Home Page**

support.ti.com

**TI Semiconductor KnowledgeBase Home Page**

support.ti.com/sc/knowledgebase

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Finland (English) +358 (0) 9 25173948 Russia +7 (0) 95 7850415  
France +33 (0) 1 30 70 11 64 Spain +34 902 35 40 28  
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## Getting Started with TI DSPs



## Web-Based DSP Support Tool Available Now

Responding to demand from engineers recently becoming more familiar with DSP, TI launched an easy-to-use, web-based tool that helps customers progress their designs from inspiration to implementation. Designers choosing to use TI DSPs in their real-time applications receive easy-to-access introductory DSP content through TI's Getting Started with DSP website ([www.ti.com/gettingstarted](http://www.ti.com/gettingstarted)), which decreases the learning curve and accelerates products to market.

Due to a myriad of applications in multiple markets utilizing digital signal processing, the number of first-time DSP designers needing guidance on getting started is expanding. TI's new support tool reduces complexity and leaves engineers with a clear roadmap of actions and activities that will accelerate their development time.

This web-based tool answers the following primary questions:

- What is DSP?
- Which TI DSP should I use?
- How do I get going?
- What else can help me?

### Basic Steps to Starting Development

#### • Step One: Selecting a DSP Processor

If you are not sure which TI DSP platform will best suit your application, visit [Which TI DSP Do I Use?](#) to assist you in your decision.

#### • Step Two: Evaluation of DSP Technology and Tools

The Evaluation stage includes learning how to use a DSP, evaluation of the DSP as a possible processor solution and evaluation of development tools.

#### • Step Three: Initial Development

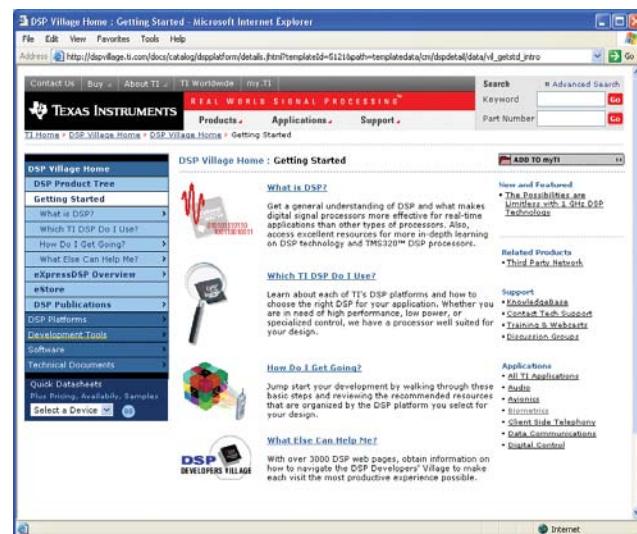
In the Initial Development stage, you have already decided which DSP to use, but beta boards have not been built. The tools to meet the needs of this stage include Code Composer Studio™ Development Tools and Evaluation Modules (EVMs).

#### • Step Four: Product Development

In the Product Development stage, there is a need for full development capabilities – including debugging of product hardware and software. Tools designed to meet those needs include Code Composer Studio and emulation tools.

- As you progress in your development, you can speed your time-to-market by utilizing Texas Instruments' Third Party Network. The Third Party Network offers the most extensive collection of digital signal processing development support in the industry.

The easily navigated site describes digital signal processing and offers extensive training. In addition, the site discusses how signal processing tasks can be implemented on a DSP as well as when to use such a device.



Since personal electronic devices have power, performance and price demands that are perfectly suited to a certain type of DSP, the site also aids designers in determining which TI DSP platform is right for their applications. Providing the customers a clear understanding of each option, it connects to information such as white papers and technical briefs.

Aside from being a tutorial on TI DSPs, the site also offers precise information on how to begin designing, what problems to look for as well as how to solve those problems. With resources available both on and off the Web, customers can minimize their design time and employ the industry knowledge of TI's in-house experts.

The support continues even once the design process commences. Texas Instruments developed the industry's most comprehensive support network that can be accessed using the new on-line tool. Building on the premise that a supplier should facilitate the design process, the network encompasses training, technical information and access to experts. TI will be completely supportive throughout the entire DSP design process.

To assist you in getting started with DSP, TI offers the free "The Essential Guide to Getting Started with DSP" CD-ROM which includes a variety of resources to start your DSP design. To order your free CD, visit: [www.ti.com/getstartedwithdsp](http://www.ti.com/getstartedwithdsp). Or, to start utilizing the Getting Started with DSP web-based tool, visit [www.ti.com/gettingstarted](http://www.ti.com/gettingstarted)

**Audio****Audio System Solutions**Get additional information at: [www.ti.com/audio](http://www.ti.com/audio)**Targeted Applications**

- Musical instruments
  - Instrument amplifiers
  - Multi-track recorders
  - Synthesizers
  - Guitar effects
- Professional audio
  - Digital mixers
  - Signal processors
  - Broadcast encoders
  - DSP farms
- Home audio
  - AV receivers
  - DVD receivers
  - Home audio jukeboxes
  - Networked audio players
- Portable audio devices
  - HDD-based MP3 players
  - Flash/CD-based MP3 players
  - Wireless audio headphones
- Digital radio

**Audio Systems Overview**

Advances in digital audio technologies offer consumers the ability to enjoy their audio at anytime, anywhere and on any device. This new trend in audio is enabled by DSPs that offer this convenience without any sacrifice in quality. DSP technology is also at the forefront of another amazing trend in consumer audio products, the multichannel listening experience. Due to the rapid drop in price points, consumers are enjoying music, movies and television on high-quality, DSP-based 5.1 audio systems.

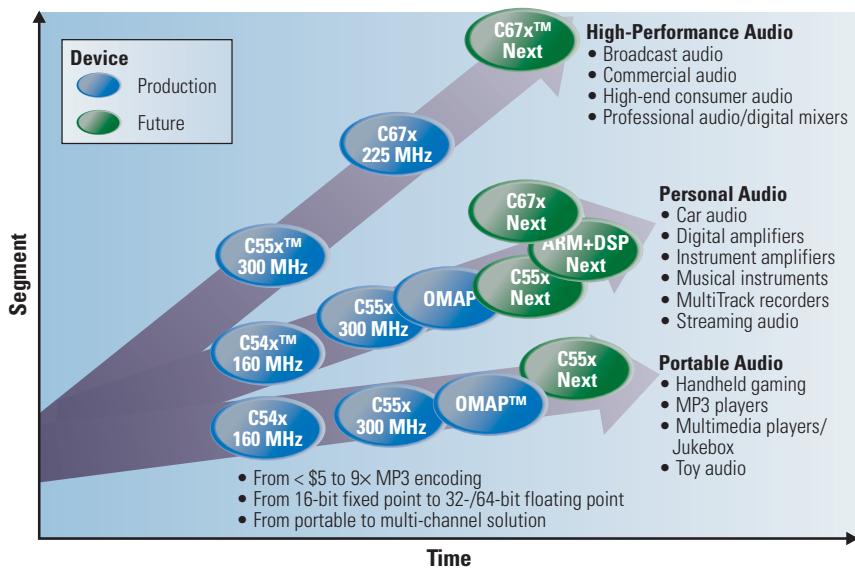
Just as the consumer audio market is benefiting from advances in audio technology, the professional and musical instrument markets are delivering new products that maintain the highest sonic quality at affordable price points. By leveraging DSP horsepower, these markets are giving musicians and sound engineers the ability to create the exact sounds they want.

In order to enable designers of digital audio products to leverage advanced

digital audio techniques, TI provides silicon, software, systems expertise and support focused solely on digital audio technologies. TI currently offers a host of products including DSPs, class-D amplifiers, A/Ds, D/As and SRCs that are designed from the ground up to deliver the most realistic audio experience possible at cost-effective price points. Since TI solutions are based on programmable platforms and flexible analog components, developers have maximum flexibility in designing products that meet the needs of the rapidly changing digital audio landscape.

**TI Audio Systems Benefits**

- Highest performance allows room for innovation with application-specific digital entertainment solutions
- Programmability and scalability provide open-audio platforms for better differentiation
- Compact form factor for cool product designs and great sound
- Easy-to-use, application-specific software and tools get you to market faster





## Audio eXpressDSP™-Compliant Third-Party Algorithms

Texas Instruments, in conjunction with its industry-leading DSP Third Party Network, offers eXpressDSP-compliant

algorithms for audio designed to reduce system integration time and lower support and development costs. For a listing

of algorithms and the third parties that make these available, see pages 64–70 or visit [www.ti.com/algorithms](http://www.ti.com/algorithms)

AUDIO ALGORITHMS	
3D Stereo	
AAC Decoder	
AAC Encoder	
Acoustic Echo Canceller	
Adaptive Noise Canceller	
Chorus	
Chorus Effect	
Circle Surround II	
Dolby® 5.1 Encode	
Echo Effect	
Equalizer	
Flange Sound Effect	
Flanger	

AUDIO ALGORITHMS (CONTINUED)	
Full-Duplex Echo Cancellation	
Full-Spectrum Dynamic Compression	
Function Generator	
Mixer	
Mono Eq 4 Band	
MP3 Decoder	
MP3 Encoder	
MPEG-2 AAC Encoder	
MPEG-2 L3 Decoder	
MPEG-2/4 AAC Decoder	
MPEG-2/4 AAC Encoder	
MPEG-4 AAC LC Decoder	
MPEG-4 AAC LC Encoder	

AUDIO ALGORITHMS (CONTINUED)	
Noise Reduction	
Noise Reduction, Low Frequency	
Pathfinder Noise Suppression	
Phase-Corrected Equalization	
Reverb	
Reverb Effect	
Sample Rate Conversion	
Speech Compressor for Hearing Aids	
Time-Scale Tailor	
VIP – Voice Intelligibility	
WMA Decoder	

## Audio Application Notes

Application Note	Web Search Literature #
OMAP5910 Processor Audio System Design	SPRA970
Decoding Convolutional and Turbo Codes in 3G Wireless White Paper	SPRA878
MP3/AAC™ Player Implementation in RF3	SPRA779
Using the File Navigation API Function in an IACD System	SPRA834
Electronic Shock Protection (ESP) for CD Players That Use a C54x™ DSP	SPRA831
TMS320C6201/6701 EVM: TMS320C6000 McBSP to Multimedia Audio Codec	SPRA477

Application Note	Web Search Literature #
TMS320C6000™ McBSP to Voice Band Audio Processor (VBAP) Interface	SPRA489
AIC27 Example for the TMS320C5510 DSP Prototype Board	SPRA813
Implementation of AC-3 Decoder on TMS320C62x DSPs	SPRA724
An Audio Example Using DSP/BIOS™ Kernel	SPRA598
Interfacing TLC320AD57 Sigma-Delta Stereo ADC (in Master Mode) with TMS320C5x DSP	SPRA090

Check the TI website for a complete listing of technical documentation including application notes.



## Biometrics

### Biometrics System Solutions

Get additional information at: [www.ti.com/biometrics](http://www.ti.com/biometrics)

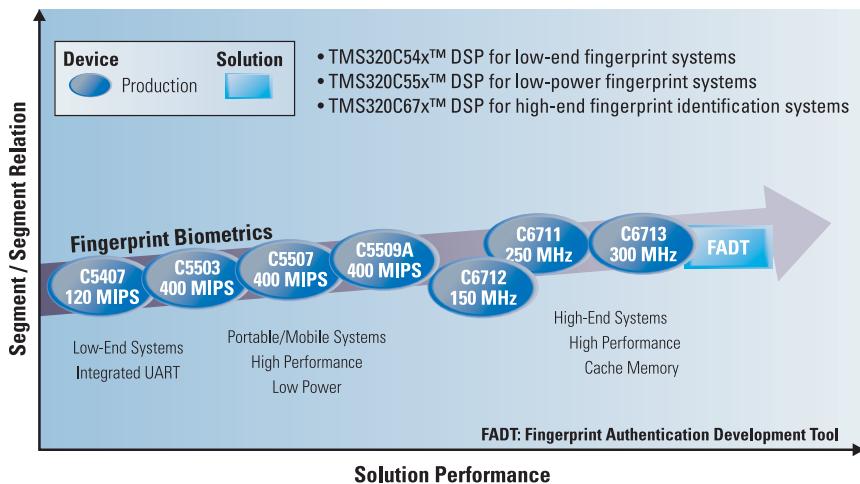
#### Targeted Applications

- Physical access/door locks
- Time and attendance
- Computer access
- Point-of-sale (POS) terminals
- Automotive and home security
- Safety deposit boxes/safes
- Cash access machines/ATMs
- Mobile phones and PDAs

#### Biometrics Systems Overview

The biometrics market is demanding intelligent security features in faster, smaller, lower-cost and convenient-to-use products. To provide the market with better security, more accuracy and speed, OEMs and security product manufacturers need to develop applications with the capability to handle intricate algorithms for processing image and video compression, image enhancement, normalization, feature extraction, matching and a host of others. A high-performing processor is

an absolute must to meet these demands, but that is not the only consideration. The growing security market needs the right mix of performance, low power consumption and system flexibility to develop the customized features for each product niche. TI offers a variety of DSPs that match these needs as well as software for many of the functions. TI's DSP performance and programmability allows you to move fast and secure your product's position in the market at the right price point.



**Biometrics Solutions Roadmap**



## Biometrics eXpressDSP™-Compliant Third-Party Algorithms

Texas Instruments, in conjunction with its industry-leading DSP Third Party Network, offers eXpressDSP-compliant

algorithms for biometrics designed to reduce system integration time and lower support and development costs. For a

listing of algorithms and the third parties that make these available, see pages 64–70 or visit [www.ti.com/algorithms](http://www.ti.com/algorithms)

BIOMETRIC ALGORITHMS
Biometrics Image Processing
Fingerprint 1 to 1
Fingerprint Recognition Pre
Fingerprint Recognition Engine
ENCRYPTION ALGORITHMS
3-DES
AES
Assembly

ENCRYPTION ALGORITHMS (CONT'D)
Audio Watermark Det. SDMI Screen
DES
DES CBC Mode
Diffie-Hellman
ELGAMAL
HMAC
HMAC-MD5
HMAC-SHA-1
IDEA Decryption

ENCRYPTION ALGORITHMS (CONT'D)
IDEA Encryption
Kasumi Encryption
MD5
MD5-V2.0
MMH-MAC
NTRU Mobile Security
RSA
RSA1024
SHA-1

## Biometrics Application Notes

Application Note	Web Search Literature #
DSP for Smart Biometric Solutions – White Paper	SPRA894
Performance Analysis of Face Recognition Algorithms on TMS320C64x™ DSPs	SPRA874
Wavelet Transforms in the TMS320C55x™ DSP	SPRA800

Application Note	Web Search Literature #
A DSP Kernel for On-Line Dynamic Handwritten Signature Verification Using TMS320™ DSPs	SPRA304
Speaker Independent Speech Recognition on the TMS320C2x and TMS320C5x DSPs	SPRA100

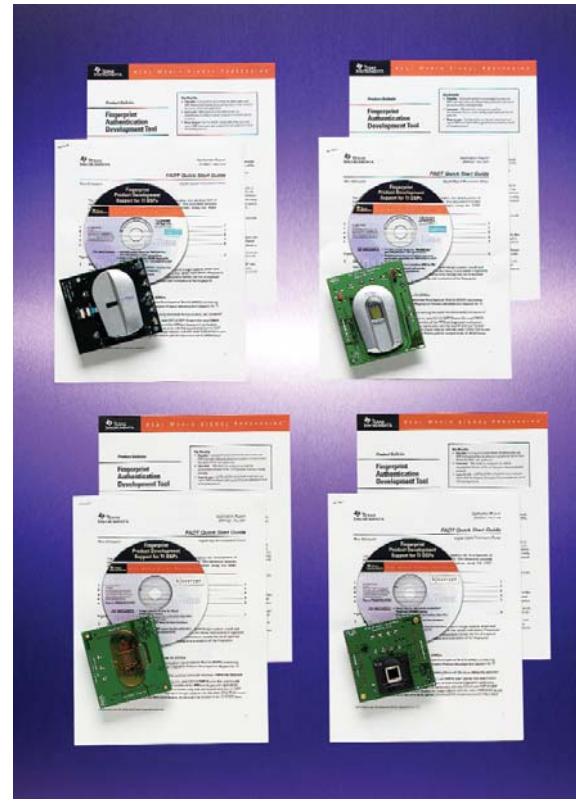
Check the TI website for a complete listing of technical documentation including application notes.

## Biometrics Integrated Solutions

**Fingerprint Authentication Development Tool (FADT)** – The FADT provides developers an easy-to-use, cost-effective way to evaluate and develop fingerprint authentication systems and products based on TI DSPs. The FADT consists of a daughter card with all the software to get you started, plus the industry's first multi-platform, DSP-based expansion board that can combine with several of TI's DSP Starter Kits (DSKs). To enhance the range of easy-to-use, affordable fingerprint development tools, TI currently offers four different FADT products. Each FADT supports the different fingerprint sensors, Fingerprint Cards FPC1010 and FPC1031 sensors, AuthenTec sensor, Atmel FingerChip™ sensor, and has associated software and drivers.

The FADT is an ideal development tool for both entry-level and experienced designers, and its flexibility allows designers to choose from a range of integrated solutions. Developers also have access to TI's robust suite of eXpressDSP™ Software and Development Tools. This flexible and complete development environment for fingerprint authentication enables developers to quickly and inexpensively evaluate and develop systems and products based on TI DSPs, resulting in highly accurate products.

For more information, contact your authorized TI distributor or visit [www.ti.com/fadt](http://www.ti.com/fadt)



Fingerprint Authentication Development Tools

**Digital Control****Digital Control System Solutions**Get additional information at: [www.ti.com/dmc](http://www.ti.com/dmc)**Targeted Applications**

- Industrial
  - Automation
  - Drives
- Automotive
  - Electronic power steering
  - Integrated starter alternators
  - Brushless motors and pumps
- Appliances/White goods
  - Drive motors
  - Water pumps
  - HVAC
- Other
  - Hand-held power tools
  - Power supplies
  - Optical networking
- Motor types
  - Single-phase
  - Three-phase
  - Sensored
  - Sensorless
  - AC induction
  - Brushless DC
  - Permanent magnet synchronous
  - Switched reluctance

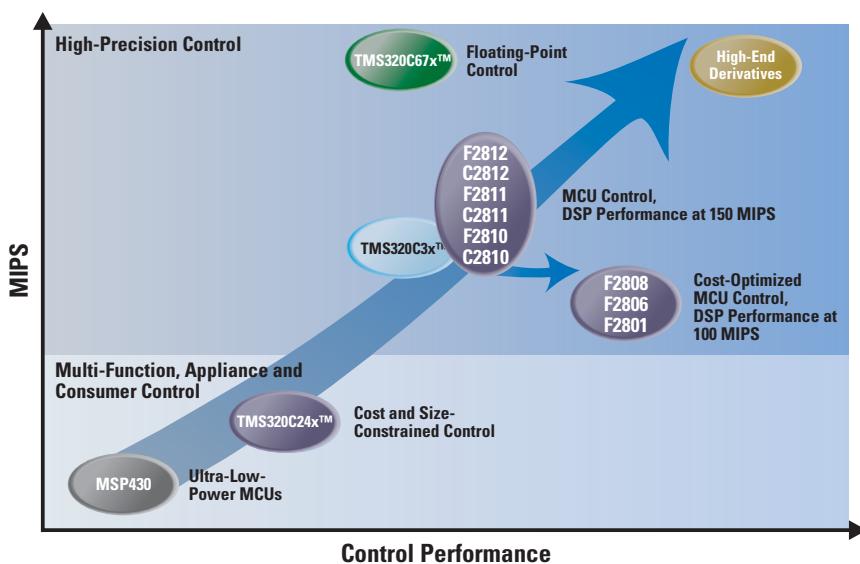
**Digital Control Overview**

Revolutionizing today's digital control applications, TI delivers performance, integration and efficiency that allows designers of appliances, white goods, HVAC systems, tunable lasers, digital power supplies, automotive and consumer electronics, industrial motor drives and hand-held power tools to quickly and easily implement advanced, cost-efficient control systems.

Our broad base of control-optimized silicon provides the industry's highest level of on-chip integration and powerful computational abilities that drive system cost down to unprecedented levels. The unique combination of processing power, interrupt handling capability, control-specific peripheral integration and high C-efficiency deliver substantial benefits

to control systems. These benefits, such as improved system efficiency and added performance for innovation, are delivered with fewer external components and reduced system costs in amazingly small packages great for space-constrained applications.

TI is focused on the digital control systems designers' needs and is continuing to develop solutions that serve the market. With more than 18 years of experience in processor-based control applications and a worldwide team dedicated to providing progressive embedded control solutions, we offer systems expertise, easy-to-use development tools, an extensive silicon range and unlimited support to get your product to market faster at lower systems costs.

**Digital Control Solutions Roadmap**



## Control Application Device Matrix

Applications		MSP430	TMS320C24x™ DSP	TMS320C28x™ DSP	TMS320C54x™ DSP	TMS320C67x™ DSP
General Motor Control	White goods	•	•	•		
	Servo and stepper motors	•	•	•		
	3-phase motors		•	•		
	Industrial drives	•		•		
	Robotics	•		•	•	•
	SMPS / UPS	•	•	•		
Digital Power Supply	Rectifiers		•	•		
	Inverters	•	•	•		
	Converters		•	•		
Optical Networking	TECS	•	•	•		
	EDFAS			•		
	MEMS OXC			•	•	•
Automotive	Electronic power steering (EPS)			•		
	Integrated starter alternator			•		
	Brushless motors			•		
Industrial	Instrumentation	•				
	Automation			•	•	
	Embedded control			•	•	

Motor-Specific Software Solutions [www.ti.com/c2000appsw](http://www.ti.com/c2000appsw) and [www.ti.com/c2000sigproplib](http://www.ti.com/c2000sigproplib)

System	Motor Type	Sensored	Sensorless	Description	C24x™ DSP	C28x™ DSP
ACI1-1	1 ph AC Induction	•		Tacho I/P VHz / SinePWM/ Closed Loop (CL) Speed PID	•	
ACI3-1	3 ph AC Induction	•		Tacho I/P VHz / SinePWM / CL Speed PID	•	•
ACI3-2	3 ph AC Induction		•	MRAS (Speed Estimator) VHz / SinePWM / CL Speed PID	•	
ACI3-3	3 ph AC Induction	•		Tacho I/P FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
ACI3-4	3 ph AC Induction		•	Direct Flux Estimator + Speed Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3-1	3 ph Permanent Magnet Synch	•		QEP FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3-2	3 ph Permanent Magnet Synch		•	SMO (Sliding Mode Observer) Position Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3-3	3 ph Permanent Magnet Synch	•		Resolver / FOC / CL Current PID for D, Q / CL Speed PID	•	
PMSM3-4	3 ph Permanent Magnet Synch	•		QEP / FOC / Position Control		•
BLDC3-1	3 ph Trapezoidal Brushless DC	•		3 Hall Effect I/P Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
BLDC3-2	3 ph Trapezoidal Brushless DC		•	BEMF / Zero Crossing Detection Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
DCMOTOR	Brushed DC	•		Speed & Position / QEP without Index		•
Digital Motor Control Library	All Motor Types	•	•	Component Modules for Motor-Specific Applications	•	•

Motor-specific software downloads available today, free of charge, that allow designers to develop solutions for both sensored and sensorless control systems.



## Digital Control

### Digital Control eXpressDSP™-Compliant Third-Party Algorithms

Texas Instruments, in conjunction with its industry-leading DSP Third Party Network, offers eXpressDSP-compliant

algorithms for digital control designed to reduce system integration time and lower support and development costs. For a

listing of algorithms and the third parties that make these available, see pages 64–70 or visit [www.ti.com/algorithms](http://www.ti.com/algorithms)

DIGITAL CONTROL ALGORITHMS
Position Control
RMS Signal Measurement
Speed Control

DIGITAL CONTROL ALGORITHMS (CONT'D)
Torque Control for BLDC
Torque Control for IMVC
Torque Control for PMSM

DIGITAL CONTROL ALGORITHMS (CONT'D)
Vector PWM for Neutral Point Clamped 3-Level Inverters

## Get Started Today

Description	Part #	\$U.S. <sup>+</sup>
<b>Development Boards</b>		
LF2407A eZdsp™ Starter Kit (DSK) <sup>°</sup>	TMDSEZD2407 (U.S. part number)	295
	TMDSEZD2407-0E (European part number)	
LF2401A eZdsp Starter Kit <sup>°</sup>	TMDSEZD2401 (U.S. part number)	295
	TMDSEZD2401-0E (European part number)	
F2812 eZdsp Starter Kit (DSK)	TMDSEZD2812 (U.S. part number)	295
Includes parallel port cable, User's Guide, Code Composer Studio™ (CCStudio) IDE for eZdsp, power supply	TMDSEZD2812-0E (European part number)	
F2812 eZdsp Starter Kit (DSP in Socket)	TMDSEZS2812 (U.S. part number)	449
Includes parallel port cable, User's Guide, CCStudio IDE for eZdsp, power supply	TMDSEZS2812-0E (European part number)	
R2812 eZdsp Starter Kit	TMDXEZR2812 (U.S. part number)	495
Includes USB cable, User's Guide, CCStudio, 256-Kbit socket EEPROM, power supply	TMDXEZR2812-0E (European part number)	
F2808 eZdsp Starter Kit (DSP in Socket)	TMDXEZD2808 (U.S. part number)	495
Includes USB cable, User's Guide, CCStudio IDE, power supply	TMDXEZD2808-0E (European part number)	
<b>Evaluation Modules</b>		
LF2407A Evaluation Module (EVM), CCStudio v 2.2, XDS510PP-Plus Emulator <sup>§</sup>	TMD3P701016A (U.S. part number)	1,995
	TMD3P701016AE (European part number)	
F2812 Development Bundle	TMDSEVP2812 (U.S. part number)	1,995
Includes eZdsp (DSP in socket), CCStudio v 2.2, XDS510PP-Plus	TMDSEVP2812-0E (European part number)	
F2812 Development Bundle	TMDSEVU2812 (U.S. part number)	2,295
Includes eZdsp (DSP in socket), CCStudio v 2.2, XDS510™ USB Emulator	TMDSEVU2812-0E (European part number)	
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS510PP-Plus Parallel Port Pod with JTAG Cable for Windows	TMDSEMUPP (U.S. part number)	1,500
	TMDSEMUPP-0E (European part number)	
XDS510 USB-Based Emulator for Windows	TMDSEMUUSB	1,995

<sup>+</sup> Prices are quoted in U.S. dollars and represent year 2005 suggested resale pricing.

New tools are listed in red.

Alternative Development Tools are available from third parties such as Spectrum Digital ([www.spectrumdigital.com](http://www.spectrumdigital.com)), Technosoft ([www.technosoft.ch](http://www.technosoft.ch)) and Softronics ([www.softronx.com](http://www.softronx.com)).

<sup>§</sup> Includes Code Composer Studio integrated development environment (IDE), code generation tools with C compiler/assembler/linker, target board and device drivers.

<sup>°</sup> Includes board-specific Code Composer IDE, code-generation tools, on-board JTAG emulation, target board and target-specific device driver.



## Telecom System Solutions

Get additional information at: [www.ti.com/telecom](http://www.ti.com/telecom)

### Targeted Applications

- Wired telephony
  - Client-side telephony – for home networking (voice/data access points)
  - Remote data collection
  - Industrial monitoring systems
  - Full-duplex speakerphones
  - SMS/MMS phones
  - Intelligent phones
- Wireless terminal (excluding handsets)
  - Broadband wireless access boxes
  - Military and police wireless communication device
  - Digital pagers
  - Amateur radios
- Telecom accessories
  - Hands-free kit
  - Bluetooth® headset
- Infrastructure telecom
  - Enterprise
  - Gateway
  - SoHo

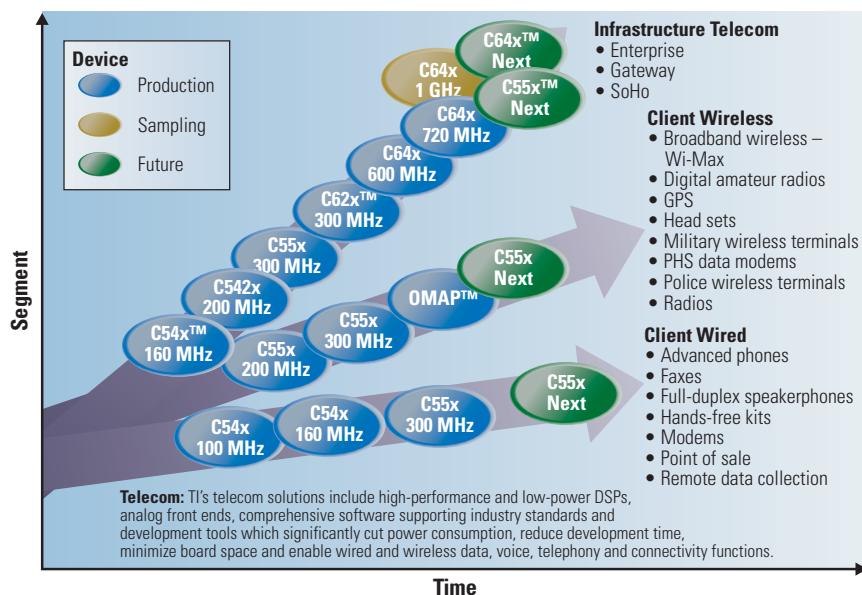
### Telecom Systems Overview

Telecom applications require the processing power to handle a wide variety of data, voice, telephony and connectivity functions. Using TI programmable DSPs, you can easily expand product capabilities and feature sets to match the demands of your design. In addition, you can customize, adapt and scale the DSP-based design to suit your particular requirements and focus on end-product differentiation.

TI offers complete DSP-based solutions for remote data collection, Internet connectivity, telephony co-processing and voiceband processing client-side telephony applications. These solutions provide

hardware including power-efficient/small form factor DSPs as well as analog front ends. In addition, comprehensive software is provided supporting industry standards as well as flexible software building blocks that accelerate the design process from concept through production.

These complete solutions significantly cut power consumption, reduce development time, minimize board space and enable multi-function applications, making a new class of Internet access devices possible. When you combine the processing power, high integration and flexibility with their low-price points and ease-of-use, TI DSPs are a perfect fit for telecom applications.



**Telecom Solutions Roadmap**

**Telecom****Telecom eXpressDSP™-Compliant Third-Party Algorithms**

Texas Instruments, in conjunction with its industry-leading DSP Third Party Network, offers eXpressDSP-compliant

algorithms for telecom designed to reduce system integration time and lower support and development costs. For a

listing of algorithms and the third parties that make these available, see pages 64–70 or visit [www.ti.com/algorithms](http://www.ti.com/algorithms)

**FAX ALGORITHMS**

T.38 Fax Relay over IP  
V.17 Modem  
V.21 Modem  
V.27 Modem  
V.27ter Modem  
V.29 Modem  
V.34 Modem

**PROTOCOL STACKS ALGORITHMS**

HDLC Generator Level 2  
HDLC Receiver  
HDLC Receiver Level 2  
HDLC Transmitter  
TCP/IP Protocol Stack

**SPEECH ALGORITHMS**

Acoustic Echo Cancellation  
Adaptive Speech Filter  
Broadband Noise Cancellation  
Caller ID Text-to-Speech  
Noise Reduction  
Sound Stretcher  
Speech Enhancement  
Text-to-Speech Synthesizer  
Speech Recognition  
Voice Activity Detector  
Voice Command Recognition

**TELEPHONY ALGORITHMS**

2100-Hz Tone Detector  
Acoustic Echo Canceller  
Auto Gain Control/Voice Activity Detector  
Call Progress Analysis  
Call Progress Decoder  
Call Progress Generator  
Call Progress Monitor  
Call Progress Tone Detector  
Caller ID Detector  
Caller ID Generator  
Caller ID, Type 1 and 2  
Comfort Noise Generator  
CPE Alert Signal  
CPT Detector

**TELEPHONY ALGORITHMS (CONT'D)**

CPT Generator  
DTMF Detector/Suppressor  
DTMF Encoder/Decoder  
Echo Cancellation, Multi-  
Echo Canceller  
Fax and Modem Tone Detect  
Frequency Shift Key Receive  
Frequency Shift Key Send  
G.165 Line Echo Cancellation  
G.167  
G.168 (Long Tail)  
G.168 (Short Tail)  
G.168-2000  
G.726 ADPCM Speech Codec  
MF (10 ms)  
MF R1 Detector  
MF R2 Forward Detector  
MF R2 Reverse Detector  
MF Line/Register Signaling  
Multifrequency Tone Detect  
Music On Hold  
Noise Floor Estimation  
Tone Detector  
Tone Disabler for LEC  
Universal Tone Detection  
Universal Multifrequency Tone Generator  
Variable Rate Conv. CODEC w/ Soft Decision  
VITERBI Decoding

**VB MODEM ALGORITHMS**

AGC  
BELL 103 Modem  
BELL 202 Modem  
Binary Phase Shift Key Modem  
G3MDP  
V.21  
V.22  
V.22 bis  
V.23  
V.32  
V.32 bis  
V.34

**VB MODEM ALGORITHMS (CONT'D)**

V.34+  
V.90  
V.92  
V.150  
V.42  
V.42 bis

**VOCODERS ALGORITHMS**

1200-BPS Codec  
2400-BPS Codec  
4800-BPS Codec  
6000-BPS Codec  
End Point Detector  
Enhanced G.711  
ESAC4 Codec  
ESAC7 Codec  
G.711 Codec  
G.711 PLC  
G.722 Codec  
G.722.1 Codec  
G.722.2 Codec  
G.723.1 Codec  
G.723A Codec  
G.726 ADPCM Codec  
G.726 U-Law ADPCM Codec  
G.728 Codec  
G.729 Codec  
G.729A Codec  
G.729AB Codec  
G.729B Codec  
G.729E Codec  
IPCM Wideband

**WIRELESS ALGORITHMS**

16-Bit CRC-CCITT Standard  
2.28-bps/Hz PTCM Decoder  
32-Bit CRC-CCITT Standard  
GSM-AMR Transcoder  
GSM AMR Codec  
GSM Enhanced Full-Rate Codec  
GSM Full-Rate Codec

**Telecom DSP Signal Processing Libraries****Signal Processing Libraries**

TMS320C5000™ DSP Foundation Software  
TMS320C54x™ DSP Software Library

**Web Search Literature #**

[www.dspvillage.ti.com/c5000dsplib](http://www.dspvillage.ti.com/c5000dsplib)  
[www.ti.com/c54xdsplib](http://www.ti.com/c54xdsplib)

**Signal Processing Libraries**

TMS320C55x™ DSP Software Library

**Web Search Literature #**

[www.ti.com/c55xdsplib](http://www.ti.com/c55xdsplib)



## Telecom Application Notes

Application Note	Web Search Literature #
TMS320C54CST Client Side Telephony DSP	SPRA187
Client Side Telephony (CST) Chipset Mode	SPRA859
TMS320C54CST Bootloader Technical Reference	SPRA853

Check the TI website for a complete listing of technical documentation including application notes.

Application Note	Web Search Literature #
Client Side Telephony (CST) Chip Flex Mode Flex Examples Description	SPRA862

## Telecom Integrated Solutions

The TMS320C5000™ DSP-based Telephony Developer's Kits include ready-to-go software and hardware that reduce your development time and allow you to focus on end-product differentiation.

**Client-Side Telephony Solution** – Perfect for customers developing remote data collection applications and advanced phone applications such as intelligent phone, SMS/MMS-enabled phone, secure phone, IP phone, USB phone and real/duplex speakerphone. This powerful tool uses the TMS320C54CST version 2.0 with 14 on-board algorithms and up to 40 kW of customizable RAM. The C54CST DSP is the industry's first complete one-chip solution – giving designers a comprehensive way of getting innovative industrial products to market quickly. For additional information, visit [www.ti.com/cst](http://www.ti.com/cst)



Client-Side Telephony Developer's Kit

**SPIRIT CORP**   
DSP Software Source

Telephony algorithms provided by SPIRIT-DSP

**Hands-Free Kit (HFK) Development Platform** – TI's HFK Development Platform is a complete DSP-based solution that brings unprecedented affordable, high-quality audio to consumer products. Providing real-time voice and audio enhancing algorithms as well as Bluetooth® connectivity, the HFK development platform enables developers to get higher quality audio products to market faster while reducing cost.



Hands-Free Kit Development Platform

With the Bluetooth daughter card, the HFK enables mobile device manufacturers to quickly and easily add Bluetooth functionality to their hands-free kit designs.

This DSP-enabled solution allows immediate development and differentiation of an end product by providing a baseline hardware and software design. The HFK development platform connects to TI's software development environment, Code Composer Studio™ Development Tools, through a JTAG connection.

This development environment combined with documentation provides fast integration of TI DSP third-party software and faster time-to-market.

The HFK development platform is ideally suited for high-quality, after-market hands-free kits where cost and performance are critical. Since the hands-free application has been fully integrated, developers can immediately focus on product differentiation. With 50-percent headroom on the TMS320C5407 DSP, developers can add a wide range of differentiating features, such as an LCD display or advanced speech recognition, to the baseline design as well as quickly integrate other functionality and algorithms available through TI's extensive network of more than 700 third party developers.

For more information, contact your authorized TI distributor or visit [www.ti.com/hfk](http://www.ti.com/hfk)

**Video and Imaging****Video and Imaging System Solutions**Get additional information at: [www.ti.com/videoandimaging](http://www.ti.com/videoandimaging)**Targeted Applications**

- Broadcast systems
- Cable head-end video equipments (routers)
- Digital camcorders
- Digital still cameras
- Digital TV and server head-ends
- Digital video recorders
- IP-based video-conferencing endpoints
- IP-based videophones
- Hard-copy appliances
- Media encoder/decoder appliances
- Personal video recorders
- Professional-grade video broadcast equipment
- Security recording systems
- Set-top boxes
- Streaming video appliances
- Video-conferencing, multi-point conference units (MCUs)/gateways
- Video jukeboxes
- Video security systems
  - Video security camera (D1, CIF resolution and low cost)
  - Digital video security recorder (DVR)
- Video surveillance cameras
- Webpads
- Wireless cameras
- Automotive video sensing
- Machine vision and cognitive medical imaging

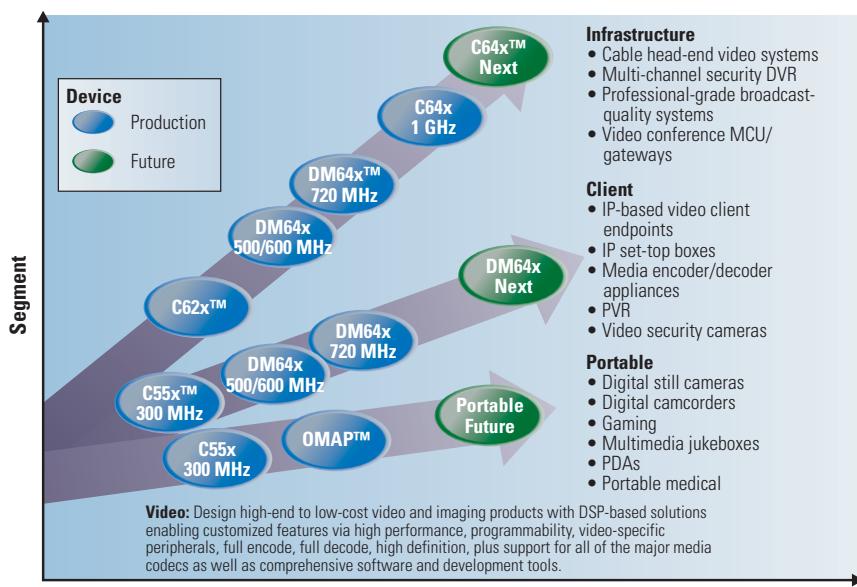
**Video and Imaging Systems****Overview**

As the video and imaging markets continue to evolve with new functionality requirements and multiple emerging video standards (i.e., MPEG-4, H.264, Windows Media®, Real Video, etc.), developers need to adapt designs with the right balance of processing performance, power consumption and system flexibility. Portable and plugged applications need different levels of support for real-time video processing such as video coding, transcoding, transrating, as well as video and imaging instruction sets plus the right power consumption to meet market demands. TI DSPs provide the processing performance and programmability other processors are unable to provide. For example, the TMS320C64x™ DSP generation can perform simultaneous real-time (30 frames/second) MPEG-4 encoding and decoding at D1 resolution with high quality.

Performance and programmability allow developers to future-proof designs now to make the challenges of the future

simply opportunities to beat competition to market.

TI offers a number of products including hardware, software and integrated system solutions that are perfect for a variety of portable and plugged video and imaging applications. Numerous application development kits are available to get these designs off the ground quickly. These kits provide hardware and software at a variety of integration levels and price points to handle real-time performance, channel density, simultaneous processing of video, audio/voice and data streams across both wired and wireless networks. These kits help the developer create designs that provide the integration of various types of digital media streams and real-time delivery, avoiding network and system-level bottlenecks. In addition, the kits provide the flexibility to upgrade evolving digital media standards in software during system deployment and reduce the latency or lag times in delivering media content across different endpoints.





## Video and Imaging Application Device Matrix

Applications		TMS320C55x™ DSP	OMAP™	TMS320C62x™ DSP	TMS320C64x™ DSP	TMS320DM64x™ DSP
Portable	Network camera	•				
	Digital still camera	•	•			
	Digital camcorder	•	•			
	Portable data terminals (PDT)	•	•			
Client	IP phone					•
	Network IP camera			•		•
	Visual inspection			•	•	•
	Personal video recorder (PVR)					•
	Smart security camera					•
	Media encoder/decoder					•
Video Infrastructure	IP set-top box					•
	Video conferencing gateways				•	•
	Professional broadcast systems				•	
	Statistical multiplexer				•	
	Cable head-end video system				•	
	Multi-channel digital video recorder (DVR)				•	•
	Wireless video gateway				•	•

## High-Performance Media Solutions

High-performance digital media technologies cover a wide range of streaming media and emerging media-based technologies including integration of video, voice and data content into many new and different applications, reshaping the way digital media content is delivered.

Some of the challenges faced by digital media include real-time performance, greater channel density and the software programming flexibility for simultaneous processing of video, voice and data streams across both wired and wireless networks. Typical digital media processing functions include encoding and decoding media streams, transcoding (converting from one format to another), and transrating streams (scaling from a

higher to a lower bit rate) to accommodate various system-level dependencies. Other processing functions include compression, decompression, encryption, packetization and transport of media streams.

TI's TMS320DM642 digital media processor and the TMS320C64x™ generation of DSPs play a major role in enabling these technologies in video and imaging solutions. Based on the proven C64x™ DSP core technology, the DM642 and the C64x DSP are the highest-performance multimedia engines that are easy to upgrade with the latest software codecs.

For more information, please visit:  
[www.ti.com/dm642intro](http://www.ti.com/dm642intro)

### Key Benefits

- Choose the option that fits your needs – broad range of high-performance/low-cost options with the TMS320DM640, DM641, DM642 and DM643 digital media processors
- Rapidly develop products with the latest algorithms due to code compatibility and full software programmability
- Utilize any video standard – the TMS320DM64x™ generation supports the latest industry standard algorithms including MPEG-4 AVC (H.264) encode and decode
- Get started today with TMS320DM642 DSP samples and the Digital Media Development Kit (DMDK)



## Video and Imaging

## Video and Imaging eXpressDSP™-Compliant Third-Party Algorithms

Texas Instruments, in conjunction with its industry-leading DSP Third Party Network, offers eXpressDSP-compliant algorithms for video and imaging

designed to reduce system integration time and lower support and development costs. For a listing of algorithms and the third parties that make these available,

see pages 64–70 or visit  
[www.ti.com/algorithms](http://www.ti.com/algorithms)

## VIDEO &amp; IMAGING ALGORITHMS

ACTL2 (800-kbps Broadband Codec)  
DVB-T Time Synchronization  
H.261 Decoder  
H.261 Encoder  
H.263 Decoder  
H.263 Decoder Ver 1.0  
H.263 Decoder Ver 2.0  
H.263 Encoder  
H.263 Encoder Ver 1.0  
H.263 Encoder Ver 2.0  
H.263 TDM to/from H.263 TCP/IP  
H.264  
H.323

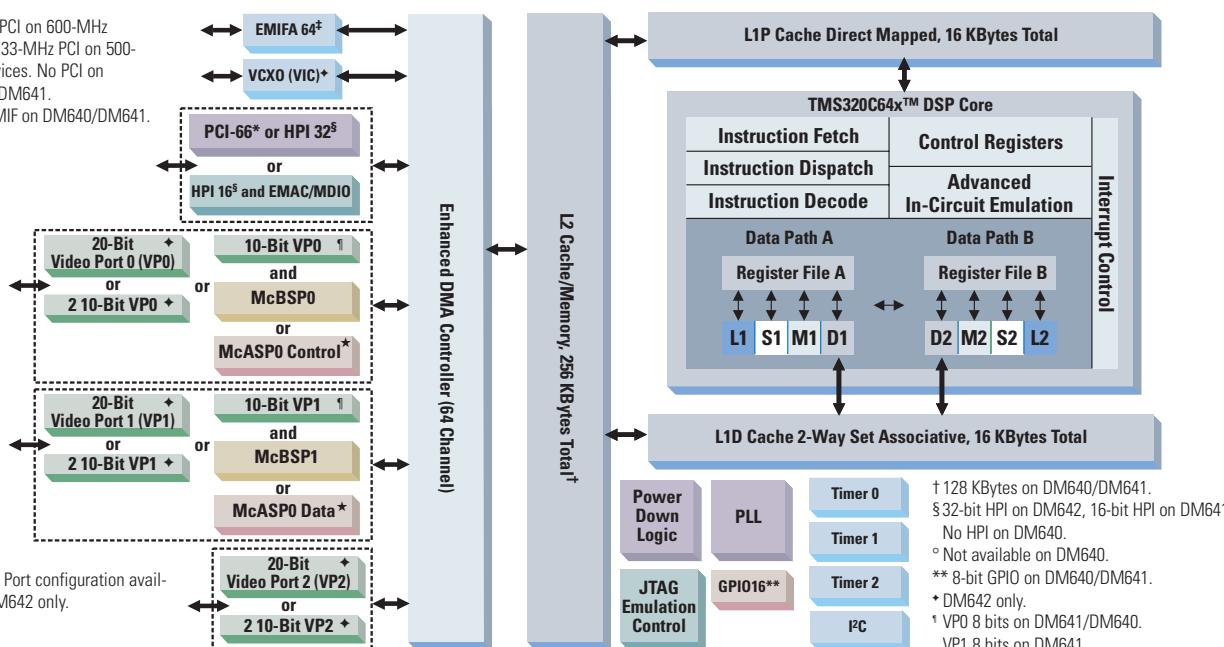
## VIDEO &amp; IMAGING ALGORITHMS (CONT'D)

JPEG Codec  
JPEG Decoder  
JPEG Encoder  
MJPEG Codec  
MJPEG Decoder  
MJPEG Encoder  
MPEG-1 Decoder  
MPEG-1 Encoder  
MPEG-2 Decoder  
MPEG-4 Adv. Simple Profile Decoder  
MPEG-4 Adv. Simple Profile Encoder  
MPEG-4 ASP Level 4 Encoder  
MPEG-4 Core Profile Encoder

## VIDEO &amp; IMAGING ALGORITHMS (CONT'D)

MPEG-4 Decoder  
MPEG-4 Encoder  
MPEG-4 Simple Profile  
MPEG-4 Simple Profile Decoder  
MPEG-4 Simple Profile Encoder  
MPEG-4 Simple Profile Video Decoder  
MPEG-4 Simple Profile Video Encoder  
MPEG-4 VSP Decoder  
OFDM Demodulator  
RMS Compression  
Speedwave Decoder  
Speedwave Encoder  
VP4 Decoder

\* 66-MHz PCI on 600-MHz devices, 33-MHz PCI on 500-MHz devices. No PCI on DM640/DM641.  
† 32-bit EMIF on DM640/DM641.



## TMS320DM640 / DM641 / DM642 DSP Block Diagram

The TMS320DM64x digital media processors give designers the industry's most powerful, flexible and easy-to-use solutions for high-performance digital media applications.

## Targeted Applications for TMS320DM64x™ Generation

- IP Phone
- Network IP Camera
- Visual Inspection
- Personal Video Recorder (PVR)
- Smart Security Camera
- Media Encoder/Decoder
- IP Set-Top Box
- Video Conferencing Gateways
- Multi-Channel Digital Video Recorder (DVR)
- Wireless Video Gateway



Get additional information at: [www.ti.com/videoandimaging](http://www.ti.com/videoandimaging)

### TMS320DM64x™ DSP Generation – Video Application-Specific Fixed-Point DSPs

Part Number	Internal RAM (Bytes) L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	Video Ports	McBSP	Enhanced DMA (Channels)	COM°	Timers	MHz	MIPS	Power (W) CPU and L1†	Total‡	Voltage (V) Core   I/O	Packaging	1 KU (\$U.S.)+	
<b>Video Application Specific</b>														
TMS320DM640GDK400	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.264	1.15	1.2	3.3	548 BGA, 23 mm	22.54
TMS320DM640GNZ400	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.264	1.15	1.2	3.3	548 BGA, 27 mm	22.54
TMS320DM641GDK500	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	500	4000	0.33	1.3	1.2	3.3	548 BGA, 23 mm	30.77
TMS320DM641GNZ500	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	500	4000	0.33	1.3	1.2	3.3	548 BGA, 27 mm	30.77
TMS320DM641GDK600	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	600	4800	0.558	1.9	1.4	3.3	548 BGA, 23 mm	33.84
TMS320DM641GNZ600	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	600	4800	0.558	1.9	1.4	3.3	548 BGA, 27 mm	33.84
<b>TMS320DM643GDK500†</b>	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC†	3	500	4000	0.33	1.3	1.2	3.3	548 BGA, 23 mm	31.95
<b>TMS320DM643GNZ500†</b>	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC†	3	500	4000	0.33	1.3	1.2	3.3	548 BGA, 27 mm	31.95
<b>TMS320DM643GDK600†</b>	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC†	3	600	4800	0.558	1.9	1.4	3.3	548 BGA, 23 mm	34.95
<b>TMS320DM643GNZ600†</b>	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC†	3	600	4800	0.558	1.9	1.4	3.3	548 BGA, 27 mm	34.95
TMS320DM642GDK500	16K/16K/256K	3 20-bit	2§	64	PCI/HPI 32/EMAC†	3	500	4000	0.33	1.3	1.2	3.3	548 BGA, 23 mm	42.89
TMS320DM642GNZ500	16K/16K/256K	3 20-bit	2§	64	PCI/HPI 32/EMAC†	3	500	4000	0.33	1.3	1.2	3.3	548 BGA, 27 mm	42.89
TMS320DM642GDK600	16K/16K/256K	3 20-bit	2§	64	PCI/HPI 32/EMAC†	3	600	4800	0.558	1.9	1.4	3.3	548 BGA, 23 mm	48.25
TMS320DM642GNZ600	16K/16K/256K	3 20-bit	2§	64	PCI/HPI 32/EMAC†	3	600	4800	0.558	1.9	1.4	3.3	548 BGA, 27 mm	48.25
TMS320DM642GDK720	16K/16K/256K	3 20-bit	2§	64	PCI/HPI 32/EMAC†	3	720	5760	0.67	2.15	1.4	3.3	548 BGA, 23 mm	67.79
TMS320DM642GNZ720	16K/16K/256K	3 20-bit	2§	64	PCI/HPI 32/EMAC†	3	720	5760	0.67	2.15	1.4	3.3	548 BGA, 27 mm	67.79

<sup>§</sup> The DM642 can be configured to have up to three serial ports in various video/McASP/McBSP combinations. Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

<sup>†</sup> The DM640 has an Ethernet MAC. The DM641 can be configured to have either a 16-bit HPI or Ethernet MAC. The DM643 can be configured to have either a 32-bit HPI or a 16-bit HPI and Ethernet MAC.

<sup>‡</sup> Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

<sup>†</sup> Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 50-MHz timers at 100% utilization. See SPRA962.

<sup>°</sup> HPI is selectable, 32-bit or 16-bit. <sup>†</sup> Production scheduled for 3Q05. <sup>‡</sup> Assumes 60% CPU utilization. <sup>†</sup> New devices are listed in red.

### Video and Imaging DSP Signal Processing Libraries

Signal Processing Libraries	Web Search Literature #
TMS320C55x™ DSP Imaging Software Library	<a href="http://www.ti.com/c55ximagingdsplib">www.ti.com/c55ximagingdsplib</a>
TMS320C62x™ DSP Image Library	<a href="http://www.ti.com/c62xdsplib">www.ti.com/c62xdsplib</a>

Signal Processing Libraries	Web Search Literature #
TMS320C64x™ DSP Image Library	<a href="http://www.ti.com/c64ximagerlib">www.ti.com/c64ximagerlib</a>

### Video and Imaging Technical Documentation

Application Notes	Web Search Literature #
Image Processing Examples with the C62x™ DSP Generation Image/Video Processing Library (IMGLIB)	SPRA886
Image Processing Examples with the C64x™ DSP Generation Image/Video Processing Library (IMGLIB)	SPRA887
Performance Analysis of Face Recognition Algorithms on C64x DSPs	SPRA874
Real-Time Digital Video Transfer via High-Speed RTDX™	SPRA398
Wavelet Transforms in the TMS320C55x™ DSP Generation	SPRA800
Programming the VC5509 DSP Multi Media Controller in Native Mode	SPRA808
H.263 Encoder: TMS320C600™ DSP Implementation	SPRA721
H.263 Decoder: TMS320C6000 DSP Implementation	SPRA703
Optimizing JPEG on the TMS320C6211 2-Level Cache DSP	SPRA705
TMS320C6000 DSP Platform JPEG Implementation	SPRA704
JPEG for Digital Panel on the TMS320C5000™ DSP Platform	SPRA664
Hardcopy Solutions, the HAVE Revolution and TI DSPs	SPRA652
Programmable DSP Platform for Digital Still Cameras	SPRA651
MPEG-2 Video Decoder: TMS320C62x DSP Implementation	SPRA649
On the Implementation of MPEG-4 Motion Compensation Using the TMS320C62x DSP Generation	SPRA586
A DSP-Based Three-Dimensional Graphics System	SPRA402

Application Notes (Cont'd)	Web Search Literature #
A DSP Kernel for On-Line Dynamic Handwritten Signature Verification Using TMS320™ DSPs	SPRA304
Digital Monopulse Doppler Radar and DSP Teaching	SPRA342
Front-End Processing for Monopulse Doppler Radar	SPRA299
Implementing the Color Space Transformation Algorithm Using the TMS320C2xx DSPs	SPRA364
DSP-Based Handprinted Character Recognition	SPRA143
High Resolution Video Using the DM642 DSP and the THS8200 Driver	SPRA961
Interfacing an LCD Controller to a DM642 Video Port	SPRA975
Software Reference Guides	
TMS320C62x DSP Image/Video Library Programmer's Reference	SPRU400
TMS320C64x DSP Image/Video Processing Library Programmer's Refer.	SPRU023
Product Bulletins	
Network Video Developer's Kit Product Bulletin	SPRT247
TMS320DM64x Digital Media Development Tools Product Bulletin	SPRT281
Videophone Development Platform Product Bulletin	SPRT344
Data Sheets	
TMS320DM642 DSP Data Sheet	SPRS200
TMS320DM641/DM640 DSP Data Sheet	SPRS222
TMS320DM643 DSP Data Sheet	SPRS269

Check the TI website for a complete listing of technical documentation including application notes.

**Video and Imaging****Video and Imaging Hardware and Software Development Tools**

Description	Part Number	\$U.S. <sup>+</sup>
<b>Hardware Development Tools</b>		
TMS320DM642 Digital Media Development Kit (DM642 DMDK)	TMDSDMK642 (U.S. part number) TMDSDMK642-0E (European part number)	6,495
Network Video Developer's Kit (NVDK)	TMDXNVK6415-T (U.S. part number) TMDXNVK6415-TE (European part number)	4,495
Video Security over Internet Protocol Development Platform (VSIP) – NTSC format	TMDXVSK642 (U.S. part number)	15,000
VSIP Development Platform – PAL format	TMDXVSK642-0E (European part number)	
VSIP Development Platform with ATEME Emulator – NTSC format	TMDXVSK642-3 (U.S. part number)	16,000
VSIP Development Platform with ATEME Emulator – PAL format	TMDXVSK642-3E (European part number)	
<b>Videophone Development Platform</b>	TMDSVDP64X-2 (U.S. part number)	6,950
<b>Evaluation Modules (EVMs)</b>		
TMS320DM642 Evaluation Module	TMDSEVM642 (U.S. part number) TMDSEVM642-0E (European part number)	1,995
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUUSB	1,995
<b>Software Development Tools</b>		
C6000™ DSP Code Composer Studio™ Development Tools <sup>°</sup> Bundled with Annual S/W Subscription Supports DM64x™, C62x™, C67x™, DM64x™ and C64x™ DSP products	TMDSCCS6000-1	3,595
C6000 DSP Code Composer Studio Development Tools Annual Software Subscription	TMDSSUB6000	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000™ DSP Code Composer Studio 90-Day Free Evaluation Tools <sup>‡</sup>	SPRC119B ( <a href="http://www.dspvillage.ti.com/freetools">www.dspvillage.ti.com/freetools</a> )	Free
TMS320C62x™ DSP Image Library	SPRC093	Free
TMS320C64x™ DSP Image Library	SPRC094	Free

<sup>+</sup> Prices are quoted in U.S. dollars and represent year 2005 suggested resale pricing.

New tools are listed in red.

<sup>\*</sup> Includes Code Composer Studio Development Tools, DSP/BIOS™ kernel, code generation tools (C/C++ compiler/assembler/linker), RTDX™, target hardware board and device drivers. Please see the features supported by platform matrix on page 60 for more details.

<sup>°</sup> Includes Code Composer Studio Development Tools, DSP/BIOS™, code generation tools (C/C++ compiler/assembler/linker), XDS510™ and XDS560™ device drivers (emulation software), RTDX™, simulator and profile-based compiler. Please see the features supported by platform matrix on page 60 for more details.

<sup>‡</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 90 days.

**Video and Imaging Integrated Solutions**

For more information on TI's video and imaging solutions, go to [www.ti.com/videoandimaging](http://www.ti.com/videoandimaging)

**TMS320DM642 Evaluation Module (DM642 EVM)** – The DM642 EVM (part number TMDSEVM642) is a low-cost, high-performance video and imaging development platform designed to jump-start application development and evaluation of multi-channel and multi-format digital applications. Leveraging the high-performance TMS320C64x DSP core, this development platform supports TI's TMS320DM642, DM641 and DM640 digital media processors. This PCI form factor EVM is supported by award-winning eXpressDSP™ host tools and target software, allowing users to quickly and easily integrate eXpressDSP-compliant algorithms from over 100 TI third parties into the included starterware, accelerating evaluation and development of digital media solutions.

For more information, contact your authorized TI distributor or visit [www.ti.com/dm642720pr](http://www.ti.com/dm642720pr)



*TMS320DM642 Evaluation Module*

## Video and Imaging



TMS320DM642 Digital Media Development Kit

**TMS320DM642 Digital Media Development Kit (DM642)**

**DMDK**) – The DMDK allows immediate development of multi-channel, multi-format digital media applications or other future-ready, high-performance video and imaging applications. Loaded with starterware, supported by eXpressDSP™ host tools and target software and offered at an exceptional price/performance ratio, the DMDK (part number TMDXDMK642) is a comprehensive, fully integrated development platform and an easy-to-use, robust tool suite. Based on the high-performance TMS320C64x™ DSP core, this development platform supports TI's DM642, DM641 and DM640 digital media processors. The DMDK is ideal for developers who have minimal experience with DSP as well as developers who are experienced with programmable DSPs and want to add multimedia functionality to an existing or new product/system.

For more information, contact your authorized TI distributor or visit [www.ti.com/dm64xdevkit](http://www.ti.com/dm64xdevkit)

**Videophone Development Platform (VDP)** – A complete development platform for designing point-to-point IP-based videophone systems, the VDP (part number TMDSVDP64X-2) empowers OEMs to bring consumer videophones to market faster. The VDP is an integrated hardware/software solution reducing both design complexity and total system bill materials, including everything developers need to begin designing point-to-point videophone systems immediately. All application system software runs on TI's 600-MHz DSP-based TMS320DM643 digital media processor, including audio/video compression, networking stacks and control protocols. The VDP includes two DSP-based boards, two CCD cameras, two 5-inch LCD displays, two phone keypads as well as the software and documentation to get started.

For more information, contact your TI sales representative or authorized TI distributor or visit [www.ti.com/vdp](http://www.ti.com/vdp)



Network Video Developer's Kit

**Videophone Development Platform (VDP)**

Videophone Development Platform

**Network Video Developer's Kit (NVDK)** – Powered by ultra-high performance C64x™ DSP technology, the NVDK (part number TMDXNVK6415-T) gives designers a complete and cost effective way to speed to market next-generation digital media applications. The NVDK provides all the hardware and software required for developing imaging and video applications, including those requiring network connectivity. The NVDK addresses video/imaging customers' most pressing needs, including full software programmability, fast time-to-market and optimum system cost. The NVDK includes: an ATEME TMS320C6415 DSP video board, 10-/100-Mbps Ethernet daughter card, audio/video interface box, power supply and a CD-ROM with schematics, drivers for PCI board support library and application samples and executable code demonstrations.

For more information, contact your TI sales representative or authorized TI distributor or visit [www.ti.com/nvdk](http://www.ti.com/nvdk)

**Video and Imaging**

VSIP Development Platform

**Video Security over Internet Protocol (VSIP) Development Platform**

**Platform** – The VSIP development platform enables developers to build intelligent security cameras that take advantage of a digital IP network by leveraging the real-time performance and flexibility inherent in DSP technology.

Offering the flexibility of a programmable DSP solution, the VSIP development platform allows developers to change compression standards, add specific processing capabilities and develop different products on the same hardware platform – enabling a wide range of products and creating a future-proof system.

Using the VSIP development platform, developers can leverage advanced digital functionality by incorporating this function directly into a standalone IP camera or by incorporating functionality into a network encoder that supplies digital intelligence for multiple standard analog surveillance cameras. In the latter scenario, developers benefit from the ability to use existing cameras without the expense of replacing them with new ones.

The VSIP includes all the hardware, software and tools needed to create a fully digital system for the encoding and transmission of camera surveillance information.

The development platform is among the first to offer MPEG-4 compression, the latest and most efficient of the MPEG video compression algorithms, designed to minimize bandwidth requirements in network video transmission. Since the VSIP is an application-oriented, open platform, it is not necessary for developers to have a deep understanding of DSP programming techniques. Moreover, application software from developers and third parties is easy to integrate, allowing straightforward customization for market differentiation.

For more information, contact your authorized TI distributor or visit [www.ti.com/vsipinfo](http://www.ti.com/vsipinfo)

**TI eStore**

**Get your product designs up and running **FAST** with TI's eStore**

Looking to get your designs to market quickly and easily? Visit TI's eStore where you can purchase TI's most popular analog and DSP development hardware and software tools all in one place. Find items including DSKs, EVMs, Daughter Cards, Code Composer Studio™ Development Tools and much more.

TI's eStore offers you:

- Same-day shipping on in-stock items
- On-line order status
- One-stop shopping convenience

Visit [www.ti-estore.com](http://www.ti-estore.com) today.  
All major credit cards accepted



DSP usage has become very diversified—from communications infrastructure to handheld, portable appliances. TI has worked with its customers and third parties to deliver DSP core architectures that are well established and optimized for diverging combinations of power-performance needs.

### Advantages of Designing with DSPs Over Other Architectures

- Multiple multiply-accumulate operations per cycle
- Real-time performance, simulation and emulation
- Flexibility
- Reliability
- Increased system performance
- Reduced system cost

### Advantages of TMS320 DSPs Over the Competition

- Highest performance DSPs
- Lowest power DSPs
- eXpressDSP™ Software and Development Tools: Industry award-winning, open software development tools
- Market leaders in compatible analog and mixed signal solutions
- Manufacturing strength and commitment
- Wide variety of packaging options
- Better support from concept to completion
- Low-cost starter kits and evaluation modules
- Cycle-accurate simulators
- Optimizing high-level language compilers
- Feature-rich integrated development environment
- Real-time scan-based emulators
- Application software library
- Technical hotline
- Largest Third Party Network in the DSP industry

Today, TI ships the highest-performance, most power-efficient, and control-optimized DSPs with roadmaps going beyond any competitive solution. And TI's commitment to code compatibility for each platform ensures your investment in software development will not be discarded when it's time to upgrade. The TMS320 DSP family delivers the most extensive selection of DSPs with three distinct architectures:

#### MCU-Like Control, DSP Performance

The TMS320C2000™ digital signal controller platform combines the control peripheral integration and ease of use of a microcontroller (MCU) and the processing power and C efficiency of TI's leading DSP technology.

- **TMS320C28x™ Digital Signal Controller Generation** – includes industry's first 32-bit DSP-based controllers with on-board Flash memory and performance up to 150 MIPS. Pin-compatible ROM versions also available.
- **TMS320C24x™ Digital Signal Controller Generation** – offers 20 to 40 MIPS of performance with highly integrated Flash memory, control and communication peripherals. Get started at sub U.S. \$2.00 (in quantities). Pin-compatible ROM versions also available.

#### Most Power Efficient

The TMS320C5000™ DSP platform is optimized for the consumer digital market – the heart of the mobile Internet – and its convergence with communications electronics.

- **TMS320C55x™ DSPs** – industry's most power-efficient DSPs and ultra-low stand-by power. Advanced power management techniques automatically power down inactive peripherals, memory and core functional units increasing battery life
- **TMS320C54x™ DSPs** – offers a broad range of performance and peripheral options
- **OMAP™ Processors** – integrate a C55x™ DSP core with an ARM® processor on a single chip

#### Highest Performance

The TMS320C6000™ DSP platform is optimized for highest performance, value and ease-of-use in high-level language programming. The C6000™ fixed- and floating-point DSPs anchor multi-service broadband infrastructure, video, performance audio and imaging applications. The C6000 platform includes:

- **TMS320C64x™ DSPs** – industry's highest-performance DSPs offer clock speeds up to 1 GHz and reduced system cost through peripheral integration
- **TMS320C62x™ DSPs** – offer cost-effective solutions to high-performance DSP programming challenges
- **TMS320C67x™ floating-point DSPs** – offer precision, speed, power savings and dynamic range with performance ranging from 600–1800 MFLOPS

#### Applications Matrix Guideline

	C2000™ DSP	C5000™ DSP	C6000 DSP	OMAP
Audio	•	•	•	•
Biometrics		•	•	•
Digital Control	•	•		
Telecom	•	•	•	•
Video and Imaging			•	•

#### Easy-to-Use Software and Development Tools

For accelerated DSP product development, the TMS320 DSP family is supported by eXpressDSP™ Software and Development Tools. This includes Code Composer Studio™ Development Tools, DSP/BIOS™ kernel and the TMS320 DSP Algorithm Standard as well as numerous options for reusable, modular software from the largest Third Party Network in the industry.



## Silicon

### TMS320C28x™ DSP Generation, Fixed Point

MCU Control. DSP Performance

Get samples, datasheets, tools and app reports at: [www.ti.com/c2000](http://www.ti.com/c2000)

#### Specifications

- 32-bit, fixed-point C28x™ DSP core
- Up to 150-MIPS operation
- 1.9-volt core and 3.3-volt peripherals
- Easy-to-use software and development tools speed time-to-market

#### Applications

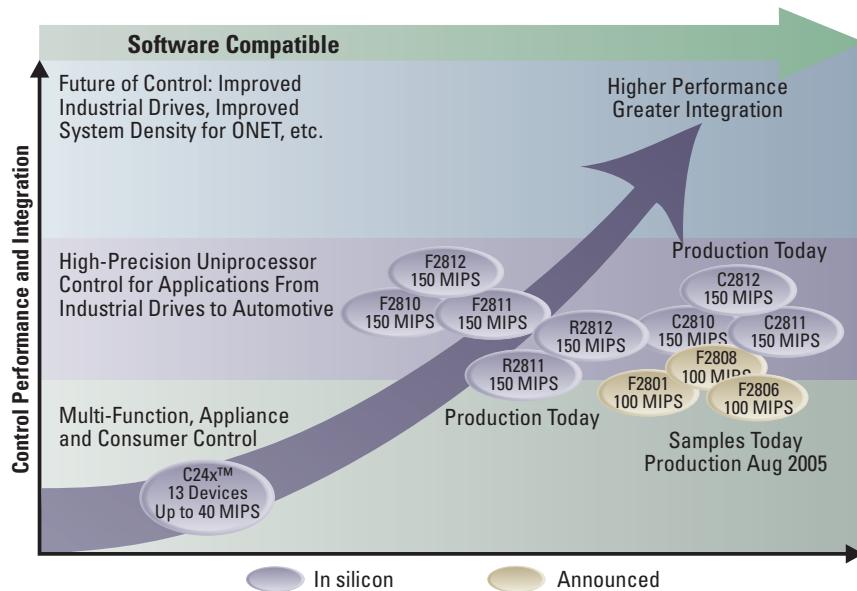
Automotive, industrial automation, appliance/white goods, power conversion, sensing and measurement

#### Features

- Ultra-fast 20–40 ns service time to any interrupts
- Powerful 20 Mbit/s data logging debug capability
- 32-/64-bit saturation, single-cycle read-modify-write instructions, and 64-/32-bit and 32-/32-bit modulus division
- Enhanced tool suites with C and C++ support
- Unique real-time debugging capabilities
- 32 × 32-bit single-cycle fixed-point MAC
- Dual 16 × 16-bit single-cycle fixed-point MACs
- Supported by 16-bit instructions for improved code efficiency
- Compatible with TMS320C24x™ DSP and TMS320C2xLP™ source code

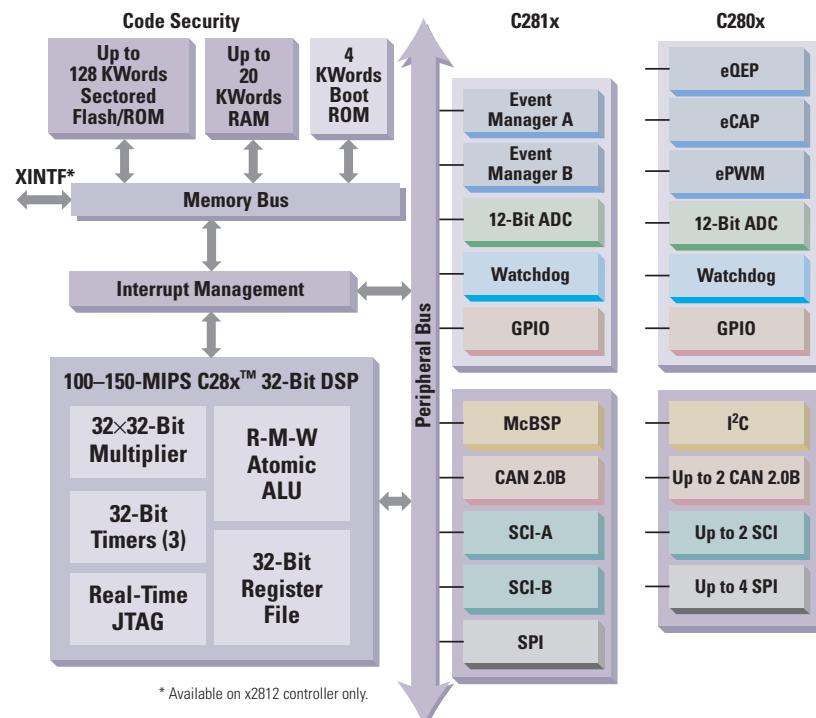
#### Peripherals

- 16 to 128 Kwords sectored Flash or factory programmed ROM (with code security)
- 12-bit A/D, as fast as 12.5-MSPS throughput with 80-ns minimum conversion time
- Flexible QEP, CAP, timers and PWM generation
- ePWM features high-resolution mode for over 12-bit resolution at 1 MHz
- Up to two serial communication interfaces (SCI / UART)
- Up to four serial peripheral interfaces (SPI)
- Up to two enhanced CAN 2.0B modules
- McBSP or I²C



### TMS320C2000 Digital Signal Controller Platform Roadmap

The C2000™ controller platform provides an optimized DSP solution for digital control systems and motor control applications including AC induction, DC brushless, permanent magnet synchronous and switched reluctance.



### TMS320C28x Digital Signal Controller Block Diagram

The C28x controllers are the industry's first 32-bit control-based DSPs with onboard reprogrammable Flash, factory programmed ROM, or cost effective RAM-only memory options and performance from 100 to 150 MIPS.

**TMS320C28x™ DSP Generation**

Device <sup>§</sup>	MIPS	Boot	RAM	Flash/ ROM		#	#	12-Bit A/D* Chs/		WD EMIF	Timer	Comm Ports				I/O Pins	Core Voltage (V)	Packaging	1 KU (\$U.S.) <sup>†</sup>
		ROM <sup>†</sup> (words)	(16-bit words <sup>†</sup> )	(16-bit words <sup>†</sup> )	Timers	CAP/ QEP	PWM	HiRes Channels	Conversion Time (ns)			Other	SPI	SCI	CAN				
<b>Flash Devices</b>																			
TMS320F2801-PZA/S/Q <sup>§</sup>	100	4K	6K	16K	9	2/1	6 + 2 <sup>‡</sup>	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	32	1.8	100 LQFP	5.79 <sup>°</sup>
TMS320F2801-GGMA/S/Q <sup>§¶</sup>	100	4K	6K	16K	9	2/1	6 + 2 <sup>‡</sup>	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	32	1.8	100 BGA*	5.79 <sup>°</sup>
TMS320F2806-PZA/S/Q <sup>§</sup>	100	4K	10K	32K	15	4/2	12 + 4 <sup>‡</sup>	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	1	32	1.8	100 LQFP	8.69 <sup>°</sup>
TMS320F2806-GGMA/S/Q <sup>§¶</sup>	100	4K	10K	32K	15	4/2	12 + 4 <sup>‡</sup>	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	1	32	1.8	100 BGA*	8.69 <sup>°</sup>
TMS320F2808-PZA/S/Q <sup>§</sup>	100	4K	18K	64K	15	4/2	12 + 4 <sup>‡</sup>	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	2	32	1.8	100 LQFP	11.52 <sup>°</sup>
TMS320F2808-GGMA/S/Q <sup>§¶</sup>	100	4K	18K	64K	15	4/2	12 + 4 <sup>‡</sup>	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	2	32	1.8	100 BGA*	11.52 <sup>°</sup>
TMS320F2810-PBKA/S/Q <sup>§</sup>	150	4K	18K	64K	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	13.81
TMS320F2811-PBKA/S/Q <sup>§</sup>	150	4K	18K	128K	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	14.73
TMS320F2812-GHHA/S/Q <sup>§¶</sup>	150	4K	18K	128K	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	179 BGA*	15.65
TMS320F2812-PGFA/S/Q <sup>§</sup>	150	4K	18K	128K	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	176 LQFP	15.65
<b>RAM-Only Devices</b>																			
TMS320R2811-PBKA/Q <sup>§</sup>	150	4K	20K	–	7	6/2	16	–	–16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	9.11 <sup>  </sup>
TMS320R2812-GHHA/Q <sup>§¶</sup>	150	4K	20K	–	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	179 BGA*	10.63 <sup>  </sup>
TMS320R2812-PGFA/Q <sup>§</sup>	150	4K	20K	–	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	176 LQFP	10.63 <sup>  </sup>
<b>ROM Devices</b>																			
TMS320C2810-PBKA/Q <sup>§</sup>	150	4K	18K	64K	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	7.05 <sup>♦  </sup>
TMS320C2811-PBKA/Q <sup>§</sup>	150	4K	18K	128K	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	8.22 <sup>♦  </sup>
TMS320C2812-GHHA/Q <sup>§¶</sup>	150	4K	18K	128K	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	179 BGA*	9.59 <sup>♦  </sup>
TMS320C2812-PGFA/Q <sup>§</sup>	150	4K	18K	128K	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	176 LQFP	9.59 <sup>♦  </sup>

<sup>†</sup> Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.<sup>\*</sup> Dual Sample/Hold.<sup>¶</sup> Contains lead. Order ZHH or ZGM package for Pb-Free/Green.<sup>§</sup> A = -40° to 85°C, S = -40 to 125°C (10% adder over A); Q = -40 to 125°C, Q100 qualified (15% adder over S)<sup>||</sup> Minimum volumes for C281x devices are 10 KU with NRE of \$11,000.<sup>♦</sup> Production scheduled for 3Q05.<sup>♦</sup> New devices are listed in red.<sup>‡</sup> CAP can be used to generate PWM<sup>†</sup> 1 word = 2 Bytes<sup>||</sup> PB-free packages available

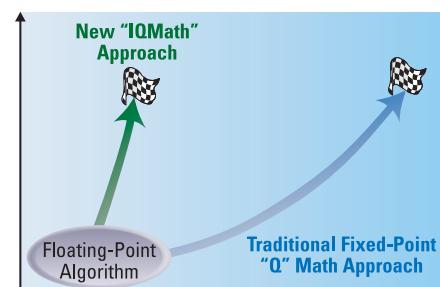
Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

**IQMath: Develop in Easy-to-Use Floating Point on a Cost-Effective, Fixed-Point Machine**

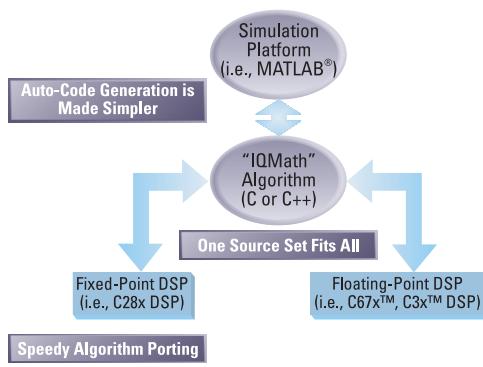
Control algorithms typically start life in a floating-point format. Until now, the conversion of such algorithms to run on a fixed-point machine was laborious and time consuming. TI's C28x™ IQMath Library makes this task easier, faster and enables:

- Seamless portability of code between fixed- and floating-point devices
- One source code set for simulation vs. target device
- Numerical resolution adjustability based on application requirement
- Numerical accuracy without sacrificing time and cycles
- Rapid conversion/porting and implementation of algorithms

For more information, visit

[www.ti.com/iqmath](http://www.ti.com/iqmath)

Slash development time and reduce overall costs with TI's IQMath: floating-point development on a fixed-point machine.



TI's C28x IQMath Library makes code development easier, faster and enables seamless portability of code between fixed- and floating-point devices.



## Silicon

### TMS320C24x™ DSP Generation, Fixed Point

MCU Control. DSP Performance

Get samples, datasheets, tools and app reports at: [www.ti.com/c2000](http://www.ti.com/c2000)

#### Specifications

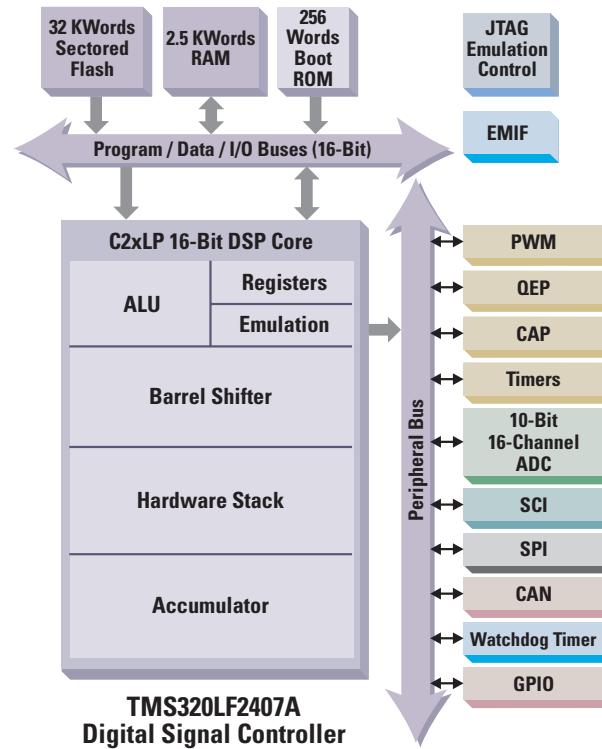
- Up to 40-MIPS operation
- Three power-down modes
- Code-compatible, control-optimized DSPs
- JTAG scan-based emulation
- 3.3-V and 5-V designs

#### Applications

- Appliances/white goods, industrial automation, power conversion, metering, office equipment, sensoring

#### Features and Peripherals

- 375-ns (minimum conversion time) analog-to-digital (A/D) converter
- Deadband logic
- Dual 10-bit A/D converters
- Up to four 16-bit general-purpose timers
- Watchdog timer module
- Up to 16 PWM channels
- Up to 41 GPIO pins
- Five external interrupts
- Up to two event managers
- Up to 32K words on-chip sectored Flash
- Controller Area Network (CAN) interface module
- Serial communications interface (SCI)
- Serial peripheral interface (SPI)
- Up to six capture units (four with QEP)
- Boot ROM (LF240xA devices)
- Code security for on-chip Flash/ROM (Lx240xA devices)



#### TMS320LF2407A Digital Signal Controller Block Diagram

For high-performance industrial applications, the Flash-based LF2407A digital signal controller includes peripherals such as a controller area network (CAN) module to enable control of multiple motors by a single DSP-based controller.



#### TMS320LF / C2401A Digital Signal Controllers: For Space-Constrained Designs

The TMS320LF/C2401A controllers pack a tremendous amount of power in an unbelievably small package. In only 49 mm<sup>2</sup>, the TMS320LF/C2401A controllers provide 40 MIPS of processing power with 500-ns conversion time, 8 Kw of sectored memory with code security and much more.



## TMS320C24x™ DSP Generation

Device	RAM <sup>†</sup>	ROM <sup>†</sup>	Flash <sup>†</sup>	Boot <sup>†</sup>	General-Purpose	Watchdog	PWM	Timer	Channels	SPI	SCI	CAN	A/D Channels**	Conversion	I/O	Voltage	MIPS	Packaging	1 KU (\$U.S.) <sup>‡</sup>
	(16-bit)	(16-bit)	(16-bit)	ROM															
TMS320LC2401AVFA <sup>‡</sup>	1K	8K	–	–	–	2	Y	7	–	Y	–	–	5 ch 0.5	13	3.3	40	32 LQFP	1.95 <sup>‡</sup>	
TMS320LC2402APGA <sup>‡,o</sup>	544	6K	–	–	–	2	Y	8	–	Y	–	–	8 ch 0.425	21	3.3	40	64 PQFP	2.60 <sup>‡</sup>	
TMS320LC2402APAGA <sup>‡,o</sup>	544	6K	–	–	–	2	Y	8	–	Y	–	–	8 ch 0.425	21	3.3	40	64 LQFP	2.60 <sup>‡</sup>	
TMS320LC2403APAGA <sup>‡,o</sup>	1K	16K	–	–	–	2	Y	8	Y	Y	Y	–	8 ch 0.425	21	3.3	40	64 LQFP	3.95 <sup>‡</sup>	
TMS320LC2404APZA <sup>‡,o</sup>	1.5K	16K	–	–	–	4	Y	16	Y	Y	–	–	16 ch 0.375	41	3.3	40	100 LQFP	4.51 <sup>‡</sup>	
TMS320LC2406APZA <sup>‡,o</sup>	2.5K	32K	–	–	–	4	Y	16	Y	Y	Y	–	16 ch 0.375	41	3.3	40	100 LQFP	5.19 <sup>‡</sup>	
TMS320LF2401AVFA	1K	–	8K	256	–	2	Y	7	–	Y	–	–	5 ch 0.5	13	3.3	40	32 LQFP	3.49	
TMS320LF2402APGA <sup>o</sup>	1K	–	8K	256	–	2	Y	8	–	Y	–	–	8 ch 0.5	21	3.3	40	64 PQFP	7.09	
TMS320LF2403APAGA <sup>o</sup>	1K	–	16K	256	–	2	Y	8	Y	Y	Y	–	8 ch 0.5	21	3.3	40	64 LQFP	8.21	
TMS320LF2406APZA <sup>o</sup>	2.5K	–	32K	256	–	4	Y	16	Y	Y	Y	–	16 ch 0.5	41	3.3	40	100 LQFP	8.33	
TMS320LF2407APGEA <sup>o</sup>	2.5K	–	32K	256	Y	4	Y	16	Y	Y	Y	–	16 ch 0.5	41	3.3	40	144 LQFP	8.83	
TMS320C242PGA <sup>o,§</sup>	544	4K	–	–	–	2	Y	8	–	Y	–	–	8 ch 0.9	26	5	20	64 PQFP	3.62 <sup>‡*</sup>	
TMS320C242FNA <sup>o,§</sup>	544	4K	–	–	–	2	Y	8	–	Y	–	–	8 ch 0.9	26	5	20	38 PLCC	3.62 <sup>‡*</sup>	
TMS320F241PGA <sup>o,§</sup>	544	–	8K	–	–	2	Y	8	Y	Y	Y	–	8 ch 0.9	26	5	20	64 PQFP	11.16	
TMS320F241FNA <sup>o,§</sup>	544	–	8K	–	–	2	Y	8	Y	Y	Y	–	8 ch 0.9	26	5	20	68 PLCC	13.36	
TMS320F243PGEA <sup>o,§</sup>	544	–	8K	–	Y	2	Y	8	Y	Y	Y	–	8 ch 0.9	32	5	20	144 LQFP	13.99	
TMS320F240PQA <sup>o,§</sup>	544	–	16K	–	Y	3	Y	12	Y	Y	–	–	16 ch 6.1	28	5	20	132 PQFP	16.21	

<sup>†</sup> Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

New devices are listed in red.

<sup>‡</sup> Pricing based on 5 KU minimum requirements due to factory ROM code.

<sup>‡</sup> Minimum volume for LC240xA devices is 10 KU with NRE of \$9,000.

<sup>\*\*</sup> 10-bit

<sup>§</sup> Not recommended for new designs.

Standard lead times are 5 weeks for Flash parts and 10 weeks for ROM-coded parts.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

<sup>o</sup> Available in industrial temperature range (A = -40 to 85°C) or extended temperature range (S = -40 to 125°C) (with 10% price adder).

<sup>†</sup> 1 word = 2 Bytes



## Tools, Software and Support

### C2000™ DSP Platform Hardware and Software Development Tools

Description	Part #	\$U.S.+
<b>Development Boards</b>		
LF2407A eZdsp™ Starter Kit (DSK)°	TMDSEZD2407 (U.S. part number) TMDSEZD2407-0E (European part number)	295
LF2401A eZdsp Starter Kit°	TMDSEZD2401 (U.S. part number) TMDSEZD2401-0E (European part number)	295
F2812 eZdsp Starter Kit (DSK) Includes parallel port cable, User's Guide, Code Composer Studio™ (CCStudio) IDE for eZdsp, power supply	TMDSEZD2812 (U.S. part number) TMDSEZD2812-0E (European part number)	295
F2812 eZdsp Starter Kit (DSP in Socket) Includes parallel port cable, User's Guide, CCStudio IDE for eZdsp, power supply	TMDSEZS2812 (U.S. part number) TMDSEZS2812-0E (European part number)	449
R2812 eZdsp Starter Kit Includes USB cable, User's Guide, CCStudio IDE, 256-Kbit socket EEPROM, power supply	TMDXEZR2812 (U.S. part number) TMDXEZR2812-0E (European part number)	495
F2808 eZdsp Starter Kit (DSP in Socket) Includes USB cable, User's Guide, CCStudio IDE, power supply	TMDXEZD2808 (U.S. part number) TMDXEZD2808-0E (European part number)	495
F2812 Development Bundle Includes eZdsp (DSP in socket), CCStudio v 2.2, XDS510PP-Plus	TMDSEVP2812 (U.S. part number) TMDSEVP2812-0E (European part number)	1,995
F2812 Development Bundle Includes eZdsp (DSP in socket), CCStudio v 2.2, XDS510™ USB Emulator	TMDSEVU2812 (U.S. part number) TMDSEVU2812-0E (European part number)	2,295
<b>Evaluation Module</b>		
LF2407A Evaluation Module (EVM), CCStudio v 2.2, XDS510PP-Plus Emulator§	TMDS3P701016A (U.S. part number) TMDS3P701016AE (European part number)	1,995
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS510PP-Plus Parallel Port Pod with JTAG Cable for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510 USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
C2000™ DSP Code Composer Studio Development Tools Bundled with Annual Software Subscription Supports C24x™ and C28x™ DSP products	TMDSCCS2000-1	495
C2000 Code Composer Studio Development Tools Annual Software Subscription	TMDSSUB2000	495
Essential Guide to Getting Started with DSP CD-ROM Includes C2000™ Code Composer Studio 90-Day Free Evaluation Tools†	SPRC119B ( <a href="http://www.dspvillage.ti.com/freetools">www.dspvillage.ti.com/freetools</a> )	Free
TMS320C2000 DSP Flash Programming Utilities	<a href="http://www.ti.com/c2000flashtools">www.ti.com/c2000flashtools</a>	Free

\* Prices are quoted in U.S. dollars and represent year 2005 suggested resale pricing.

New tools are listed in red.

§ Includes Code Composer Studio integrated development environment (IDE), code generation tools with C compiler/assembler/linker, target board and device drivers.

† Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker), emulator and simulator configurations all limited to 90 days.

° Includes board-specific Code Composer IDE, code-generation tools, on-board JTAG emulation, target board and target-specific device driver.

Alternative Development Tools are available from third parties such as Spectrum Digital ([www.spectrumdigital.com](http://www.spectrumdigital.com)), Technosoft ([www.technosoft.ch](http://www.technosoft.ch)) and Softronics ([www.softronix.com](http://www.softronix.com)).

Please see the features supported by platform matrix on page 60 for more details.

### C2000 DSP Literature and Related Technical Documentation

Data Sheets	Web Search Literature #	Hardware Reference Guides (Cont'd)	Web Search Literature #
TMS320F2810 / F2811 / F2812 DSP Data Sheet	SPRS174	TMS320F / C240 DSP Controllers Reference Guide: Peripheral Library and Specific Devices	SPRU161
TMS320C2810 / C2811 / C2812 DSP Data Sheet	SPRS174	TMS320F243 / F241 / C242 DSP Controllers Reference Guide: System and Peripherals	SPRU276
TMS320R2811 / R2812 Data Sheet	SPRS257	TMS320F20x / F24x DSP Embedded Flash Memory Technical Reference	SPRU282
TMS320F2801 / F2806 / F2808 Data Sheet	SPRS230	<b>Product Bulletins / Brochures</b>	
TMS320C242 DSP Data Sheet	SPRS063	TMS320C28x Product Bulletin	SPRT242
TMS320F243 / F241 DSP Data Sheet	SPRS064	TMS320C2000 Platform Overview	SPRB160
TMS320LF2407A / LF2406A / LF2403A / LF2402A / LC2406A / LC2404A / LC2402A DSP Data Sheet	SPRS145	Smart Sensing Brochure	SPRT301
TMS320LF2401A DSP Data Sheet	SPRS161	DMC Software Brochure	SPRB165
<b>Hardware Reference Guides</b>		DMC Overview Brochure	SPRB166
TMS320F / C24x DSP Controllers Reference Guide: CPU and Instruction Set	SPRU160	Motor Control Solutions CD-ROM	<a href="http://www.ti.com/motorcontrolcd">www.ti.com/motorcontrolcd</a>
TMS320LF / LC240xA DSP Controllers Reference Guide: System & Periph.	SPRU357		

Check the TI website for a complete listing of technical documentation including application notes.

**C2000™ DSP Platform Tools Documentation**

Hardware Reference Guides		Web Search Literature #
TMS320F240 DSP Controllers Evaluation Module Technical Reference Guide		SPRU248
TMS320F28x DSP Analog-to-Digital Converter (ADC) Peripheral Reference Guide		SPRU060
TMS320F28x DSP Event Manager (EV) Peripheral Reference Guide		SPRU065
TMS320C28x™ DSP CPU and Instruction Set Reference Guide		SPRU430
TMS320F28x DSP Boot ROM Peripheral Reference Guide		SPRU095
TMS320F28x DSP Control and Interrupts Peripheral Reference Guide		SPRU078
TMS320F28x DSP Enhanced Controller Area Network (eCAN) Peripheral Reference Guide		SPRU074
TMS320F28x DSP External Interface (XINTF) Peripheral Reference Guide		SPRU067
TMS320F28x DSP Serial Peripheral Reference Guide		SPRU059
TMS320F28x DSP Multi-channel Buffered Serial Port (McBSP) Peripheral Reference Guide		SPRU061
TMS320F28x DSP Serial Communications Interface (SCI) Peripheral Reference Guide		SPRU051

Hardware Reference Guides (Cont'd)		Web Search Literature #
TMS320F28x DSP Peripherals Reference Guide		SPRU566
<b>Software Reference Guides</b>		
TMS320C28x DSP Assembly Language Tools User's Guide		SPRU513
TMS320C28x DSP Optimizing C/C++ Compiler User's Guide		SPRU514
Code Composer Studio™ Getting Started Guide		SPRU509
TMS320™ DSP Algorithm Standard Rules and Guidelines		SPRU352
TMS320 DSP Algorithm Standard API Reference		SPRU360
TMS320 DSP Algorithm Standard Demonstration Application		SPRU361
TMS320 DSP Algorithm Standard Developer's Guide		SPRU424
TMS320C28x DSP Instruction Set Simulator Technical Overview		SPRU608
TMS320C28x DSP/BIOS™ Application Programming Interface (API) Reference Guide		SPRU625
<b>Product Bulletins</b>		
TMS320F2812 eZdsp™ DSP Starter Kit (DSK) Product Bulletin		SPRT243
XDS560™ Emulator Product Bulletin		SPRB148
TMS320LF2401 Product Bulletin		SPRT278

Check the TI website for a complete listing of technical documentation including application notes.

A complete listing of documentation can be found online in the specific device product folder (ex: <http://focus.ti.com/docs/prod/folders/print/tms320f2812.html>).

**Motor-Specific Software Solutions** [www.ti.com/c2000appsw](http://www.ti.com/c2000appsw)

System	Motor Type	Sensored	Sensorless	Description	C24x™ DSP	C28x™ DSP
ACI1_1	1 ph AC Induction	•		Tacho I/P VHz / SinePWM/ Closed Loop (CL) Speed PID	•	
ACI3_1	3 ph AC Induction	•		Tacho I/P VHz / SinePWM / CL Speed PID	•	•
ACI3_2	3 ph AC Induction		•	MRAS (Speed Estimator) VHz / SinePWM / CL Speed PID	•	
ACI3_3	3 ph AC Induction	•		Tacho I/P FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
ACI3_4	3 ph AC Induction		•	Direct Flux Estimator + Speed Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3_1	3 ph Permanent Magnet Synch	•		QEP FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3_2	3 ph Permanent Magnet Synch		•	SMO (Sliding Mode Observer) Position Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3_3	3 ph Permanent Magnet Synch	•		Resolver / FOC / CL Current PID for D, Q / CL Speed PID		•
PMSM3_4	3 ph Permanent Magnet Synch	•		QEP / FOC / Position Control		•
BLDC3_1	3 ph Trapezoidal Brushless DC	•		3 Hall Effect I/P Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
BLDC3_2	3 ph Trapezoidal Brushless DC		•	BEMF / Zero Crossing Detection Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
DCMOTOR	Brushed DC	•		Speed & Position / QEP without Index		•
Digital Motor Control Library	All Motor Types	•	•	Component Modules for Motor-Specific Applications	•	•

**C2000 DSP Platform Support**

C2000 DSP Application Notes	<a href="http://www.ti.com/mcappnotes">www.ti.com/mcappnotes</a>
C2000 DSP Application Software	<a href="http://www.ti.com/c2000appsw">www.ti.com/c2000appsw</a>
C2000 DSP Signal Processing Libraries	<a href="http://www.ti.com/c2000sigproclib">www.ti.com/c2000sigproclib</a>
C2000 DSP Platform Developer's Kits	<a href="http://www.ti.com/c2000devkit">www.ti.com/c2000devkit</a>



## Power Management Products

### Power Management Products for the C2000™ DSP Platform

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

#### Suggested Texas Instruments Power Management Solutions for the TMS320C24x™ DSP Generation

DSP Part Number	LDO	8–40 V <sub>IN</sub> Controller	9–26 V <sub>IN</sub> Plug-In Module
5.0 V			
TMS320C242	REG103-5	TPS40054	PT5101
TMS320F240	REG103-5	TPS40054	PT5101
TMS320F241	REG103-5	TPS40054	PT5101
TMS320F243	REG103-5	TPS40054	PT5101

DSP Part Number	LDO	8–40 V <sub>IN</sub> Controller	9–26 V <sub>IN</sub> Plug-In Module	5 V <sub>IN</sub> Converter	5 V <sub>IN</sub> Plug-In Module
3.3 V					
TMS320LC2401A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LC2402A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LC2404A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LC2406A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LF2401A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LF2402A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LF2403A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LF2406A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>
TMS320LF2407A	REG103-33	TPS40054	PT5103	TPS54316	PTHxx050W <sup>2</sup>

#### Suggested Texas Instruments Power Management Solutions for the TMS320C28x™ DSP Generation

DSP Part Number	1.9-V LDO	Dual LDO	8–40 V <sub>IN</sub> Controller	9–26 V <sub>IN</sub> Plug-In Module	3.3/5 V <sub>IN</sub> Converter	5 V <sub>IN</sub> Plug-In Module
1.9-V Core/3.3-V I/O						
TMS320F2810	TPS79501	TPS70102	TPS40054	PT5103	TPS54110	PTHxx050W <sup>2</sup>
TMS320F2811	TPS79501	TPS70102	TPS40054	PT5103	TPS54110	PTHxx050W <sup>2</sup>
TMS320F2812	TPS79501	TPS70102	TPS40054	PT5103	TPS54110	PTHxx050W <sup>2</sup>

Supervised Voltage	1.8 V	3.3 V	5 V	Adj <sup>3</sup>
Dual SVS <sup>1</sup>	TPS3305-18	N/A	N/A	TPS3110
Supply Voltage Supervisor	TPS3128E18	TPS3823-33	TPS3823-50	TPS3110K33

Note 1: Other supervised voltage is 3.3 V

Note 2: xx is determined by input bus voltage:  $V_{IN} = 12\text{ V}$  then  $xx = 12$ ,  $V_{IN} = 5\text{ V}$  then  $xx = 05$ , and  $V_{IN} = 3.3\text{ V}$  then  $xx = 03$ .

Note 3: Adjustable supply voltage supervisors are available for other core voltages

Note 4: Visit [www.ti.com/dsppower](http://www.ti.com/dsppower) for one-stop DSP power management support



## TMS320C55x™ DSP Generation, Fixed Point

Industry's Best Power Efficiency

Get samples, datasheets, tools and app reports at: [www.ti.com/c5000](http://www.ti.com/c5000)

### Specifications

- Broad portfolio of the industry's most power-efficient DSPs with standby power as low as 0.12 mW and performance up to 600 MIPs
- Lowest industry standby power greatly extends battery life
- Software compatible with all C5000™ DSPs
- Easy-to-use software and development tools speed time-to-market

### Applications

Feature-rich, miniaturized personal and portable products; 2G, 2.5G and 3G cell phones and basestations; digital audio players; digital still cameras; electronic books; voice recognition, GPS receivers; fingerprint/pattern recognition; wireless modems; headsets; biometrics

### Features

- Advanced automatic power management
- Configurable idle domains to extend your battery life
- Shortened debug for faster time-to-market
- Large on-chip RAM of 32 KB–320 KB

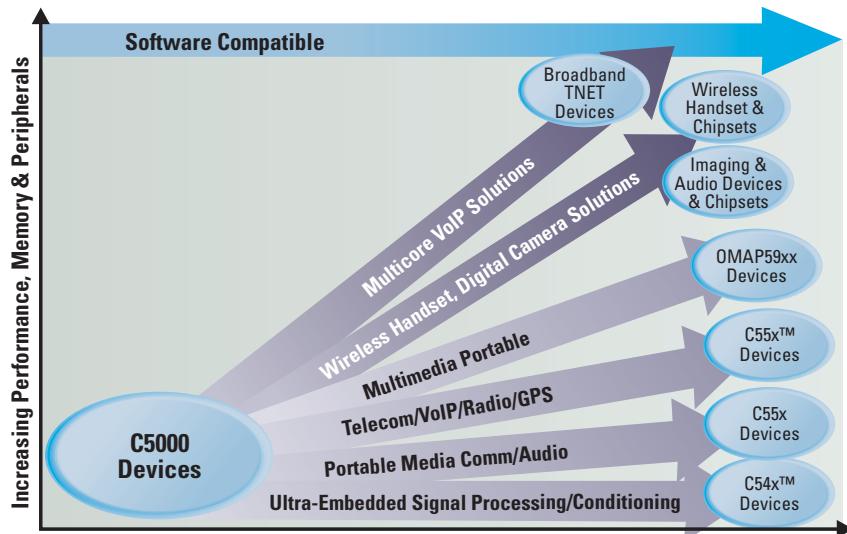
### TMS320509A DSP – Portable and Connected DSP Optimized for Portable/Industrial Medical Markets

- Dual MAC/200 MHz/400 MIPs
- USB 2.0 full-speed compliant (12 Mbps)
- Large on-chip SRAM
- 10-bit ADC, real-time clock (RTC), glueless media interfaces to MMC and SD
- Very low standby power of 0.12 mW

### TMS320C5501 / C5502 DSPs – Price and Performance Leaders

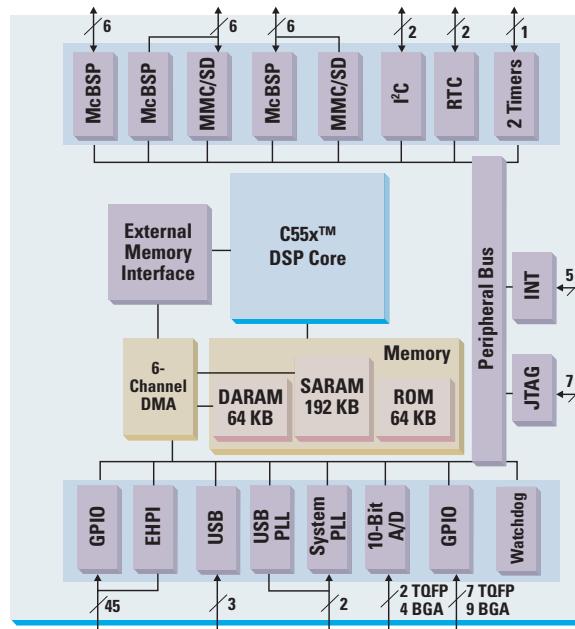
- 300-MHz clock rate
- 32-/64-KB RAM, 32-KB ROM
- Two/Three multi-channel buffered serial ports (McBSPs), I<sup>2</sup>C, general-purpose timers, watchdog timer, UART
- 16-/32-bit EMI

### TMS320C5510 DSP – Ideal for Memory-Intensive Applications



### C5000 DSP Platform Roadmap

The C5000 DSPs span the applications spectrum with core performance extended to 300 MHz.



### TMS320C5509A DSP Block Diagram

The C5509A DSP is the portable and connected DSP optimized for portable/industrial medical markets.



## Silicon

## TMS320C55x™ DSP Generation

Part Number	RAM	ROM		DAT/PRO (ADDR)						MMC/	Voltage (V)							1 KU	
	(Bytes)	(Bytes)	DMA	(Words)	USB	ADC	UART	I <sup>2</sup> C	RTC	McBSP <sup>†</sup>	SD	Core	I/O	COM	Timers <sup>§</sup>	MHz	MIPS	Packaging	(\$U.S.) <sup>†</sup>
TMS320VC5501GZZ300 <sup>○</sup>	32K	32K	6 ch	8M	—	—	Y	Y	—	2	—	1.26	3.3	HPI8	3*	300	600	201 BGA <sup>○</sup>	4.99
TMS320VC5501PGF300 <sup>○</sup>	32K	32K	6 ch	8M	—	—	Y	Y	—	2	—	1.26	3.3	HPI8	3*	300	600	176 LQFP	4.99
TMS320VC5502GZZ200 <sup>○</sup>	64K	32K	6 ch	8M	—	—	Y	Y	—	3	—	1.26	3.3	HPI16/8	3*	200	400	201 BGA <sup>○</sup>	7.51
TMS320VC5502PGF200 <sup>○</sup>	64K	32K	6 ch	8M	—	—	Y	Y	—	3	—	1.26	3.3	HPI16/8	3*	200	400	176 LQFP	7.51
TMS320VC5502PGF300 <sup>○</sup>	64K	32K	6 ch	8M	—	—	Y	Y	—	3	—	1.26	3.3	HPI16/8	3*	300	600	176 LQFP	9.66
TMS320VC5502GZZ300 <sup>○</sup>	64K	32K	6 ch	8M	—	—	Y	Y	—	3	—	1.26	3.3	HPI16/8	3*	300	600	201 BGA <sup>○</sup>	9.66
<b>TMS320VC5503GHH</b>	64K	64K	6 ch	8M	—	—	—	Y	Y	3	—	1.6	3.3	HPI16	2*	200	400	179 BGA <sup>○</sup>	7.83
<b>TMS320VC5503PGE</b>	64K	64K	6 ch	8M	—	—	—	Y	Y	3	—	1.6	3.3	HPI16	2*	200	400	144 LQFP	7.83
<b>TMS320VC5507GHH</b>	128K	64K	6 ch	8M	Y	Y	—	Y	Y	3	—	1.6	3.3	HPI16	2*	200	400	179 BGA <sup>○</sup>	11.29
<b>TMS320VC5507PGE</b>	128K	64K	6 ch	8M	Y	Y	—	Y	Y	3	—	1.6	3.3	HPI16	2*	200	400	144 LQFP	11.29
TMS320VC5509AGHH <sup>†</sup>	256K	64K	6 ch	8M	Y	Y	—	Y	Y	3	Y	1.6	3.3	HPI16	2*	200	400	179 BGA <sup>○</sup>	17.28
TMS320VC5509APGE <sup>†</sup>	256K	64K	6 ch	8M	Y	Y	—	Y	Y	3	Y	1.6	3.3	HPI16	2*	200	400	144 LQFP	17.28
TMS320VC5510AGGW1	320K	32K	6 ch	8M	—	—	—	—	—	3	—	1.6	3.3	HPI16	2	160	320	240 BGA <sup>○</sup>	17.34
TMS320VC5510AGGW2	320K	32K	6 ch	8M	—	—	—	—	—	3	—	1.6	3.3	HPI16	2	200	400	240 BGA <sup>○</sup>	20.40

Note: All devices include software PLL.

<sup>†</sup> Multi-channel buffered serial port (McBSP)<sup>○</sup> MicroStar BGA™ package<sup>§</sup> 3 = Two general-purpose timers and one 32-bit DSP/BIOS™ kernel counter, 2 = Two general-purpose timers

\* Plus 1 additional programmable watchdog timer

○ Extended temperature device, -40 to 85°C case temperature operation

† 8 Kword Secure ROM and JTAG disconnect option

+ Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs

New devices are listed in red.



## MicroStar BGA™ Package Comparison

The ultra-small physical size (12 mm × 12 mm × 1.4 mm) of the C5000™ DSP MicroStar BGA (ball grid array) packaging can also help increase the performance per square inch for MIPS-intensive or space-constrained applications.

The C5509A DSP is also pictured in a 144-pin LQFP.



## TMS320C54x™ DSP Generation, Fixed Point

### Power-Efficient Performance DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c5000](http://www.ti.com/c5000)

#### Specifications

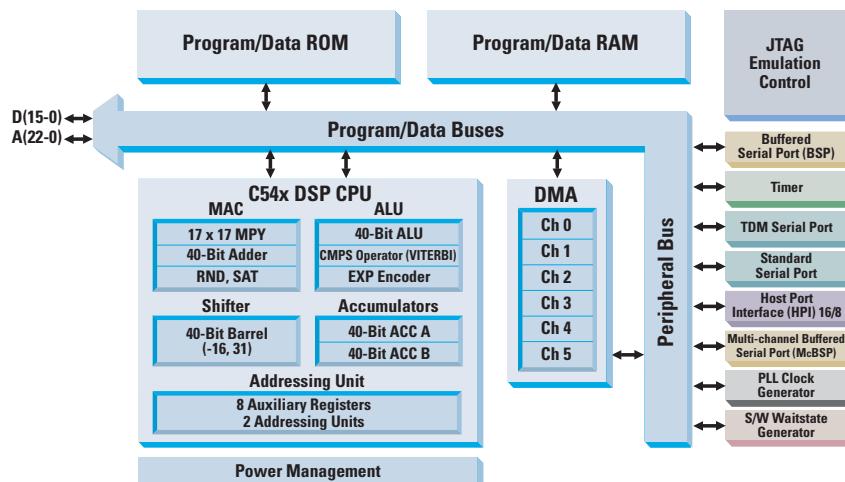
- 16-bit fixed-point DSPs
- Power dissipation as low as 40 mW
- Single- and multi-core products delivering 30–532 MIPS performance
- 1.2-, 1.8-, 2.5-, 3.3- and 5-V versions available
- Three power-down modes
- Integrated RAM and ROM configurations
- Auto-buffered serial port
- Multi-channel buffered serial port
- Host port interface
- Ultra-thin packaging (100-, 128-, 144- and 176-pin LQFPs; 143-, 144-, 176- and 169-pin MicroStar BGAs™)
- 6-channel DMA controller per core

#### Applications

Digital cellular communications, personal communications systems, pagers, personal digital assistants, digital cordless communications, wireless data communications, networking, computer telephony, voice over packet, portable Internet audio, modems

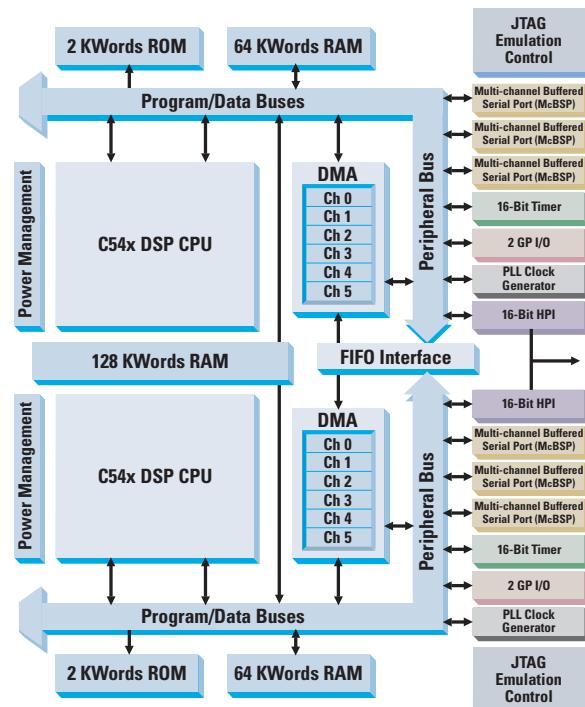
#### Features

- Integrated VITERBI accelerator
- 40-bit adder and two 40-bit accumulators to support parallel instructions
- 40-bit ALU with a dual 16-bit configuration capability for dual one-cycle operations
- 17 × 17 multiplier allowing 16-bit signed or unsigned multiplication
- Four internal buses and dual address generators enable multiple program and data fetches and reduce memory bottleneck
- Single-cycle normalization and exponential encoding
- Eight auxiliary registers and a software stack enable advanced fixed-point DSP C compiler
- Power-down modes for battery-powered applications



#### C54x™ DSP Generation Block Diagram

This block diagram of the C54x DSP is a comprehensive diagram showing all peripheral options. C54x DSPs are optimized to meet the performance, cost and low-power needs of wireless and wireline communications systems as well as emerging applications like IP phones, VoP and portable applications.



#### TMS320C5421 Multicore DSP Block Diagram

The C5420 and C5421 DSPs are dual-core DSPs targeted at carrier-class voice and video end equipments. The C5441 DSP features four C54x DSP cores on a single piece of silicon, offering 532 MIPS and is targeted at high-channel density solutions.



## Silicon

## TMS320C54x™ DSP Generation

Part Number	RAM (Bytes)	ROM (Bytes)	DAT/PRO (ADDR) (Bytes)	McBSP	Voltage (V)		COM	Timers	DMA	MHz	MIPS	Packaging	1 KU (\$U.S.) <sup>+</sup>
<b>Single Core DSPs</b>													
TMS320C54CSTPGE*	80K	256K	128K/16M	2	1.5	3.3	HPI 8/16	2	6	120	120	144 LQFP	7.89
TMS320C54CSTGGU*	80K	256K	128K/16M	2	1.5	3.3	HPI 8/16	2	6	120	120	144 BGA <sup>o</sup>	7.89
TMS320VC5401PGE50	16K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	50	50	144 LQFP	4.08
TMS320VC5401GGU50	16K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	50	50	144 BGA <sup>o</sup>	4.08
TMS320VC5402PGE100	32K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	100	100	144 LQFP	5.37
TMS320VC5402GGU100	32K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	100	100	144 BGA <sup>o</sup>	5.37
TMS320VC5402APGE16	32K	32K	128K/16M	3	1.6	3.3	HPI 8	1	6	160	160	144 LQFP	10.10
TMS320VC5402AGGU16	32K	32K	128K/16M	3	1.6	3.3	HPI 8	1	6	160	160	144 BGA <sup>o</sup>	10.10
TMS320VC5404PGE	32K	128K	128K/16M	3	1.5	3.3	HPI 8/16	2	6	120	120	144 LQFP	7.40
TMS320VC5404GGU	32K	128K	128K/16M	3	1.5	3.3	HPI 8/16	2	6	120	120	144 BGA <sup>o</sup>	7.40
<b>TMS320UC5405GQW</b>	16K	4K	64K/1M	2	1.8	3.6	HPI 8	2	6	80	80	143 BGA <sup>o</sup>	5.60
TMS320VC5407PGE	80K	256K	128K/16M	3	1.6	3.3	HPI 8/16	2	6	120	120	144 LQFP	8.92
TMS320VC5407GGU	80K	256K	128K/16M	3	1.6	3.3	HPI 8/16	2	6	120	120	144 BGA <sup>o</sup>	8.92
TMS320VC5409PGE-80	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	80	80	144 LQFP	7.90
TMS320VC5409GGU-80	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	80	80	144 BGA <sup>o</sup>	7.90
TMS320VC5409PGE100	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	100	100	144 LQFP	9.70
TMS320VC5409GGU100	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	100	100	144 BGA <sup>o</sup>	9.70
TMS320VC5409APGE12	64K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	11.47
TMS320VC5409AGGU12	64K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA <sup>o</sup>	11.47
TMS320VC5409APGE16	64K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	12.70
TMS320VC5409AGGU16	64K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA <sup>o</sup>	12.70
TMS320VC5410PGE100	128K	32K	128K/16M	3	2.5	3.3	HPI 8	1	6	100	100	144 LQFP	27.40
TMS320VC5410GGW100	128K	32K	128K/16M	3	2.5	3.3	HPI 8	1	6	100	100	176 BGA <sup>o</sup>	27.40
TMS320VC5410APGE12	128K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	13.77
TMS320VC5410AGGU12	128K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA <sup>o</sup>	13.77
TMS320VC5410APGE16	128K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	15.24
TMS320VC5410AGGU16	128K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA <sup>o</sup>	15.24
TMS320VC5416PGE120	256K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	22.95
TMS320VC5416GGU120	256K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA <sup>o</sup>	22.95
TMS320VC5416PGE160	256K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	25.50
TMS320VC5416GGU160	256K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA <sup>o</sup>	25.50
<b>Multicore DSPs</b>													
TMS320VC5420PGE200 <sup>†</sup>	400K	—	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 LQFP	59.25
TMS320VC5420GGU200 <sup>†</sup>	400K	—	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 BGA	59.25
TMS320VC5421PGE200 <sup>†</sup>	512K	8K	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 LQFP	60.70
TMS320VC5421GGU200 <sup>†</sup>	512K	8K	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 BGA	60.70

<sup>o</sup> MicroStar BGA™ package<sup>†</sup> Multicore devices (VC542x = 2)

\* Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

\* Client side telephony (CST) software bundle information on page 11.

† Internal bootloader not available on VC5420 DSP

Note: All devices include software PLL.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

New devices are listed in red.



## OMAP™ Processors, Fixed Point

## System-Level DSPs

Get samples, datasheets, tools and app reports at: [www omap.com](http://www omap.com)

## Applications

## *Portable Data Terminals (PDT)*

- Portable medical devices
  - Portable defibrillation
  - Home medical test and analysis
  - PDT for patient/medical personal
- Asset and inventory management
  - Parcel tracking and location
  - Stock inventory and replenishment
  - Real-time data capture, analysis and interpretation
- Point of sale
  - Sales and membership processing
  - Merchandising and pricing management
  - Verification and authentication
- Enterprise PDT
  - Commercial and business applications
  - Enhanced employee productivity

## Key Features

- Extensive peripheral set supporting glueless interface to multiple radio technologies (GSM/GPRS, WLAN, BT, RF)
- Industry-leading C55x™ DSP core offering portable data terminal-centric algorithms via TI DSP Third Party Network
- Multibus architecture for PDT system-level optimization
- On-chip frame buffer supporting multiple display variations
- Hardware encryption engine enabling industry-standard security applications
- Robust man/machine interface ARM9 core for multiple operating systems and application programs

## OMAP59xx Processors Support

- Microsoft® Windows® CE
- Linux®
- Accelerated Technologies Nucleus™
- WindRiver Systems VxWorks™
- Texas Instruments DSP/BIOS™ kernel
- And many more

## Embedded OMAP Processors: OMAP5910 and OMAP5912

## Addressing the Needs of Next-Generation Embedded Designers for Portable Data Terminal Applications

The dual-core OMAP59xx processor integrates a TMS320C55x™ DSP core with an ARM9 core on a single chip for the optimal combination of application performance and low power consumption. This unique architecture offers an attractive solution to both DSP and ARM developers, by providing the low-power, real-time signal processing capabilities of a DSP coupled with the command and control functionality of an ARM.

TI's software development support, OMAP Technology Centers (OTCs), OMAP Developer's Network, and third party tools provide a user-friendly software development infrastructure. The OMAP59xx processors are ideal for designers working with devices that require embedded applications processing in a connected environment such as portable data terminals.

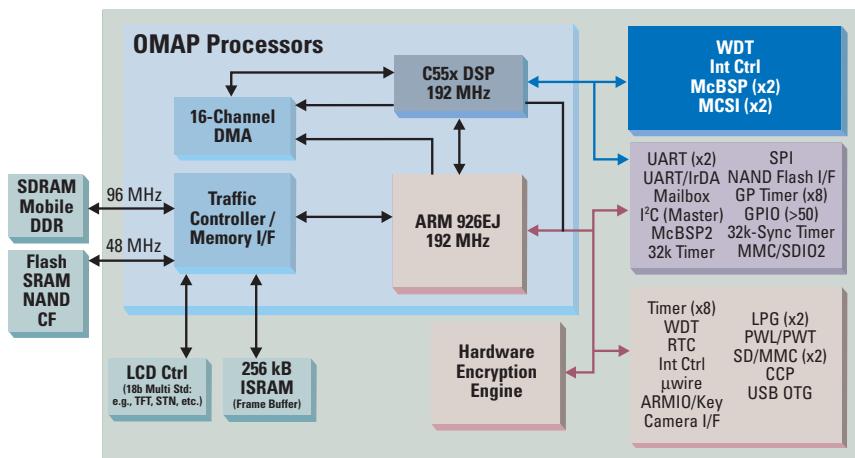
## Familiar Development Environment Speeds Design Cycle

The OMAP59xx processor enables embedded developers to program using familiar development environments by supporting leading operating systems such as Microsoft Windows CE, Linux, Accelerated Technology's Nucleus, WindRiver's VxWorks, Green Hills INTEGRITY®, Enea OSE and TI's DSP/BIOS real-time scalable kernel among others.

This open development environment makes it possible for designers to deliver innovative products to the market faster, utilizing familiar tools, a standard application programming interface (API) and a seamless interface to the DSP through an optimized interprocessor communication mechanism. The built-in interprocessor communication mechanism eliminates the need for developers to program the RISC and DSP independently resulting in reduced programming efforts.

Sampling today: OMAP5912 processor

Available today: OMAP5910 processor



OMAP5912 Peripheral Block Diagram

*OMAP5912 processor diagram with ARM926 and C55x DSP cores and peripherals.*



## Silicon

### OMAP™ Processors

Part Number	CPU	Frequency	RAM	ROM	External	DMA	Timers	Serial Ports	Misc	Voltage (V)		Packaging	1 KU (\$U.S.) <sup>+</sup>
		(MHz)	(Bytes)	(Bytes)	Memory I/F					Core	I/O		
OMAP5910JGZG2	C55x	150	160K	32K	SDRAM*, ASYNC*	6 Ch	3 GP, 1 WDT	2 McBSP*, 2 MCSI*	3 Video HW Accel, 14 GPIO*, MMU	1.6	1.8/ 2.75/3.3 <sup>§</sup>	289 BGA°, 12 × 12 mm	28.80
	ARM9TDMI	150	192K <sup>†</sup>		SDRAM, ASYNC	9 Ch	1 OS, 3 GP, 1 WDT	3 Host or 2 Host/ 1 Function USB 1.1, 1 McBSP, µwire, I <sup>2</sup> C, HDO, 3 UARTs (1 IrDA) <sup>†</sup>	LCD, Camera, MMC/SD, RTC, Keypad, 10 GPIO, MMU				
OMAP5910JGDY2	C55x	150	160K	32K	SDRAM*, ASYNC*	6 Ch	3 GP, 1 WDT	2 McBSP*, 2 MCSI*	3 Video HW Accel, 14 GPIO*, MMU	1.6	1.8/ 2.75/3.3 <sup>§</sup>	289 BGA°, 19 × 19 mm	32.00
	ARM9TDMI	150	192K <sup>†</sup>		SDRAM, ASYNC	9 Ch	1 OS, 3 GP, 1 WDT	3 Host or 2 Host/ 1 Function USB 1.1, 1 McBSP, µwire, I <sup>2</sup> C, HDO, 3 UARTs (1 IrDA) <sup>†</sup>	LCD, Camera, MMC/SD, RTC, Keypad, 10 GPIO, MMU				
OMAP5912ZZG	C55x	192	160K	32K	SDRAM*, NAND Flash*	6 Ch	4 GP, 1 WDT	2 McBSP*, 2 MCSI*, 3 UARTs*	4 Video HW Accel, 24 KByte I-Cache	1.6	1.8/ 2.75/3.3 <sup>§</sup>	289 BGA, 12 × 12 mm	33.47
	ARM926EJ-S	192	256K <sup>†</sup>		SDRAM, ASYNC	17 Ch	1 OS, 3 GP, 1 WDT	Host/Function USB 1.1, USB On-the-Go (OTG), 1 McBSP, µwire, I <sup>2</sup> C, HDO, SPI, V-Link	Self-Powered RTC, LCD, CompactFlash, Camera, 2 MMC/SD, Keyboard, DPLL, PWT/PWL, 2 LED			Lead free	
OMAP5912ZDY	C55x	192	160K	32K	SDRAM*, NAND Flash*	6 Ch	4 GP, 1 WDT	2 McBSP*, 2 MCSI*, 3 UARTs*	4 Video HW Accel, 24 KByte I-Cache	1.6	1.8/ 2.75/3.3 <sup>§</sup>	289 BGA, 19 × 19 mm	33.47
	ARM926EJ-S	192	256K <sup>†</sup>		SDRAM, ASYNC	17 Ch	1 OS, 3 GP, 1 WDT	Host/Function USB 1.1, USB-On-the-Go (OTG), 1 McBSP, µwire, I <sup>2</sup> C, HDO, SPI, V-Link	Self-Powered RTC, LCD, CompactFlash, Camera, 2 MMC/SD, Keyboard, DPLL, PWT/PWL, 2 LED			Lead free	

\* Shared with the ARM9.

<sup>†</sup> Shared with the C55x™ CPU.

<sup>§</sup> External memory interfaces may use 1.8-, 2.75- or 3.3-V nominal.

<sup>+</sup> MicroStar BGA™ package options – GZG: 12 × 12 mm (OMAP5910JGZG2) or GDY: 19 × 19 mm (OMAP5910JGDY2)

<sup>+</sup> Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2004 suggested resale pricing.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

New devices are listed in red.

## Lead (Pb)-Free Solutions from Texas Instruments

TI is a leader in the supply of Lead (Pb)-Free integrated circuit packages. Currently more than 30 billion TI Pb-Free components are in the field with many new Pb-Free devices being added every year.



For all your Lead (Pb)-Free questions, visit  
[www.ti.com/quality](http://www.ti.com/quality)

Examples of Pb-Free package types available or planned for select devices by end of 2004:

- LQFP
- MicroStar BGA™
- MicroStar Junior™
- MSOP
- NanoFree™
- PBGA
- PDIP
- PLCC
- PowerPAD™
- QFN
- QFP
- QSOP
- SC70
- SIP
- SOIC
- SOP
- SOT223
- SOT23
- SSOP
- TO-220
- TQFP
- TSOT
- TSSOP
- TVSOP



## OMAP™ Tools, Software and Support

**OMAP Platform Tools and Software**

To aid you in developing your application with an OMAP59xx processor, the following development tools and software are available:

- The Innovator™ Development Kit for the OMAP platform is a modular development platform that supports multiple operating systems allowing maximum hardware and software design flexibility.
- Code Composer Studio™ IDE for the OMAP platform integrates all host and

target tools in a unified environment, which simplifies DSP configuration and optimization.

- A growing base of TI DSP-based software modules from third parties including over 70 eXpressDSP™-compliant, interoperable algorithms.

**Support**

OMAP Technology Centers (OTCs) are a network of third parties with extensive development experience on the OMAP platform. They have system-level expertise in operating systems, software

development and hardware integration. OTCs work with customers to develop a custom integration package. Additionally, the OMAP Developer's Network includes a number of independent companies and consultants that develop applications for the OMAP platform.

**Samples and Availability**

The OMAP5910 processor is in volume production and the OMAP5912 is sampling. Please contact an authorized TI distributor for further information.

**OMAP59xx Processors Literature and Related Technical Documentation**

Data Sheets	Web Search Literature #	Hardware User's Guides (Cont'd)	Web Search Literature #
OMAP5912 Processor Data Manual	SPRS231	OMAP5912 Multimedia Processor Display Interface Reference Guide	SPRU764
OMAP5912 Processor Silicon Errata	SPRZ209	OMAP5912 Multimedia Processor Multimedia Card (MMC/SD/SDIO) Interface Reference Guide	SPRU765
OMAP5910 Processor Data Manual	SPRS197	OMAP5912 Multimedia Processor Keyboard Interface Reference Guide	SPRU766
OMAP5910 Processor Silicon Errata	SPRZ016	OMAP5912 Multimedia Processor General-Purpose Interface Ref. Guide	SPRU767
<b>Hardware User's Guides</b>		OMAP5912 Multimedia Processor VLYNQ Serial Communications Interface Reference Guide	SPRU768
OMAP5910 Technical Reference	SPRU602	OMAP5912 Multimedia Processor Pinout Reference Guide	SPRU769
OMAP5912 Multimedia Processor Device Overview and Architecture Reference Guide	SPRU748	<b>Application Notes</b>	
OMAP5912 Multimedia Processor OMAP 3.2 Subsystem Reference Guide	SPRU749	System Initialization for the OMAP5910 Device	SPRA828
OMAP5912 Multimedia Processor DSP Subsystem Reference Guide	SPRU750	OMAP5910 ARM Program Throughput Analysis	SPRA891
OMAP5912 Multimedia Processor Clocks Reference Guide	SPRU751	OMAP System DMA Throughput Analysis	SPRA883
OMAP5912 Multimedia Processor Initialization Reference Guide	SPRU752	An RF6 JPEG Decoder Adaptation on the OMAP5910 Processor	SPRA979
OMAP5912 Multimedia Processor Power Management Reference Guide	SPRU753	Connecting TFT LCD Displays to the OMAP5910 Processor	SPRA968
OMAP5912 Multimedia Processor Security Features Reference Guide	SPRU754	OMAP5910 Processor Low-Power System Design	SPRA954
OMAP5912 Multimedia Processor Direct Memory Access (DMA) Support Reference Guide	SPRU755	Connecting Bluetooth® to the OMAP5910 Processor	SPRA986
OMAP5912 Multimedia Processor Memory Interfaces Reference Guide	SPRU756	OMAP5910 Processor Video Encoding and Decoding	SPRA985
OMAP5912 Multimedia Processor Interrupts Reference Guide	SPRU757	Connecting an 802.11b WLAN Card to the OMAP5910 Processor	SPRA984
OMAP5912 Multimedia Processor Peripheral Interconnects Ref. Guide	SPRU758	OMAP5910 Processor Audio System Design	SPRA970
OMAP5912 Multimedia Processor Timers Reference Guide	SPRU759	OMAP5910 Processor Decoupling/Filtering Techniques	SPRA906
OMAP5912 Multimedia Processor Serial Interfaces Reference Guide	SPRU760	OMAP5910 Processor NTSC or VGA Output	SPRA847
OMAP5912 Multimedia Processor Universal Serial Bus (USB) Ref. Guide	SPRU761	<b>White Papers</b>	
OMAP5912 Multimedia Processor Multi-channel Buffered Serial Ports (McBSPs) Reference Guide	SPRU762	Multimedia Technologies on Terminals Based on OMAP Platform	SWPY006
OMAP5912 Multimedia Processor Camera Interface Reference Guide	SPRU763	Enabling the Killer Application	SWPY004
		Bringing Streaming Video to Wireless Handheld Devices	SWPY005

Check the TI website for a complete listing of technical documentation including application notes.

**OMAP59xx Processor On-Line Training**

For more information on OMAP on-line training classes, go to: [www.ti.com/omaptraining](http://www.ti.com/omaptraining)

OMAP5910 Processor Product Overview	<a href="http://www.ti.com/omap5910">www.ti.com/omap5910</a>
OMAP Application Development Using DSP/BIOS™ Bridge for Symbian OS	<a href="http://www.ti.com/omapsymbian">www.ti.com/omapsymbian</a>
An Efficient Hardware and Software Architecture for Dual-Core OMAP Processor Systems	<a href="http://www.ti.com/omap5910">www.ti.com/omap5910</a>
Software Development for OMAP Processors: High-Level Operating Systems and Integration of DSP Algorithms	<a href="http://www.ti.com/omapdevelopers">www.ti.com/omapdevelopers</a>



## Tools, Software and Support

### C5000™ DSP Platform Hardware and Software Development Tools

Description	Part #	\$U.S.+
<b>C5000 DSP Starter Kits (DSKs)</b>		
TMS320C54x™ DSP Starter Kit (DSK), TMS320C5416 DSP based*	TMDSDSK5416 (U.S. part number)	395
	TMDSDSK5416-0E (European part number)	
TMS320C55x™ DSP Starter Kit (DSK), TMS320C5510 DSP based*	TMDSDSK5510 (U.S. part number)	395
	TMDSDSK5510-0E (European part number)	
Fingerprint Authentication Development Tool	TMDSFDCFPC10	245
<b>OMAP5912 OMAP™ Starter Kit (OSK)§</b>	TMDXOSK5912 (U.S. part number)	295
	TMDXOSK5912-0E (European part number)	
<b>OMAP Development Kit</b>		
Deluxe Innovator™ Development Kit for OMAP†	INNOVATOREVMV1	2,995
Innovator Development Kit demo	<a href="http://www.dspvillage.com/multimedia/innovator.ram">www.dspvillage.com/multimedia/innovator.ram</a>	Free
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number)	1,500
	TMDSEMUPP-0E (European part number)	
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
C5000 DSP Code Composer Studio™ Development Tools‡ bundled with Annual Software Subscription Supports C54x™, C55x™ and C5000 multicore DSPs	TMDSCCS5000-1	3,595
C5000 DSP Code Composer Studio Development Tools Annual Software Subscription	TMDSSUB5000	600
Code Composer Studio 90-Day Free Evaluation Tools‡ for OMAP CD-ROM	SPRC049 ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free
Code Composer Studio Development Tools for the OMAP Platform† bundled with Annual Software Subscription Supports OMAP devices, C54x, C55x, ARM7, ARM9 and multicore DSPs	TMDSCCSOMAP-1	5,400
Code Composer Studio Development Tools for OMAP Platform Annual Software Subscription	TMDSSUBOMAP	900
Essential Guide to Getting Started with DSP CD-ROM Includes C5000 Code Composer Studio 90-Day Free Evaluation Tools‡	SPRC119B ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free
C54x DSP Software Library	SPRC099	Free
C55x DSP Software Library	SPRC100	Free
C55x DSP Imaging Software Library	SPRC101	Free
C54x DSP Chip Support Library	SPRC132	Free
C55x DSP Chip Support Library	SPRC133	Free

\* Prices are quoted in U.S. dollars and represent year 2005 suggested resale pricing.

New tools are listed in red.

\* Includes a DSK version of Code Composer Studio™ Development Tools restricted for use only with the DSP target board included in the kit, power supply and cables.

Please see the features supported by platform matrix on page 60 for more details.

† Includes Code Composer Studio Development Tools, DSP/BIOS™ kernel, code generation tools (C/C++/assembler/linker), XDS510™ and XDS560™ device drivers (emulation software), RTDX™, and simulators. Please see the features supported by platform matrix on page 60 for more details.

‡ Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker), emulator and simulator configurations all limited to 90 days.

§ OSK includes board with OMAP5912 processor, board support library, Linux® kernel and GNU development tools from Montavista. CCStudio and emulator are sold separately.

### C5000 DSP Platform Tools and Software Documentation

Software Reference Guides	Web Search Literature #	Software Reference Guides (Cont'd)	Web Search Literature #
TMS320C55x DSP Programmer's Guide	SPRU376	TMS320C54x DSP Assembly Language Tools User's Guide	SPRU102
TMS320C55x DSP Optimizing C/C++ Compiler User's Guide	SPRU281	TMS320C54x DSP Library Programmer's Reference	SPRU518
TMS320C55x DSP Assembly Language Tools User's Guide	SPRU280	TMS320C55x DSP Library Programmer's Reference	SPRU422
TMS320C54x DSP Instruction Set Simulator Technical Overview	SPRU598	OMAP Instruction Set Simulator Technical Overview	SPRU601
TMS320C54x DSP Optimizing C/C++ Compiler User's Guide	SPRU103	TMS320C55x DSP Instruction Set Simulator Technical Overview	SPRU599
Code Composer Studio Getting Started Guide	SPRU509	TMS320C54x DSP Chip Support Library API User's Guide	SPRU420
TMS20™ DSP/BIOS™ User's Guide	SPRU423	TMS320C55x DSP Chip Support Library API User's Guide	SPRU433
TMS320C5000 DSP/BIOS Application Programming Interface (API) Reference Guide	SPRU404	TMS320C55x DSP CSL USB Programmer's Reference	SPRU511
TMS320C55x DSP Image/Video Processing Library Programmer's Ref.	SPRU037	<b>Product Bulletin</b>	
		XDS560 Emulator Product Bulletin	SPRB148

Check the TI website for a complete listing of technical documentation including application notes.

**C5000™ DSP and TMS320™ DSP Algorithm Standard Literature and Related Technical Documentation**

Data Sheets	Web Search Literature #	Hardware User's Guides (Cont'd)	Web Search Literature #
TMS320VC5401 DSP Data Sheet	SPRS153	TMS320C55x DSP Mnemonic Instruction Set Reference Guide	SPRU374
TMS320VC5402 DSP Data Sheet	SPRS079	TMS320C55x DSP Peripherals Reference Guide	SPRU317
TMS320UC5405 DSP Data Sheet	SPRS199	TMS320C55x DSP Peripherals Reference Guide	SPRU317
TMS320VC5404/VC5407 DSP Data Sheet	SPRS007	<b>Software User's and Reference Guides</b>	
TMS320VC5409 DSP Data Sheet	SPRS082	TMS320C54x DSP Application Guide, Volume 4	SPRU173
TMS320VC5409A DSP Data Sheet	SPRS140	TMS320C55x DSP Library (DSPLIB) Programmer's Reference	SPRU422
TMS320VC5410 DSP Data Sheet	SPRS075	TMS320C54x-to-TMS320C55x DSP Code Migration Reference Guide	SPRU429
TMS320VC5410A DSP Data Sheet	SPRS139	TMS320C55x DSP Image/Video Processing Library Programmer's Reference	SPRU037
TMS320VC5416 DSP Data Sheet	SPRS095	TMS320C54x DSP Library Programmer's Reference	SPRU518
TMS320VC5420 DSP Data Sheet	SPRS080	TMS320 DSP Algorithm Standard Rules and Guidelines	SPRU352
TMS320VC5421 DSP Data Sheet	SPRS098	TMS320 DSP Algorithm Standard API Reference	SPRU360
TMS320VC5441 DSP Data Sheet	SPRS122	TMS320 DSP Algorithm Standard Demonstration Application	SPRU361
TMS320C54CST DSP Data Sheet	SPRS187	TMS320 DSP Algorithm Standard Developer's Guide	SPRU424
TMS320VC5502 DSP Data Sheet	SPRS166	<b>Product Bulletins</b>	
TMS320VC5509 DSP Data Sheet	SPRS163	Client-Side Telephony Solution Product Bulletin	SPRT228
TMS320VC5509A DSP Data Sheet	SPRS205	<b>Application Notes</b>	
TMS320VC5510 DSP Data Sheet	SPRS076	System Initialization for the OMAP5910 Device	SPRA828
<b>Technical Briefs and Overviews</b>		A Case Study in DSP Systems Integration – The TI 3rd Party Vocoder Demonstration	SPRA734
TMS320C55x™ DSP Technical Overview	SPRU393	Making DSP Algorithms Compliant with the TMS320 DSP Algorithm Standard	SPRA579
TMS320C55x DSP Functional Overview	SPRU312	The TMS320 DSP Algorithm Standard White Paper	SPRA581
<b>Hardware User's Guides</b>		Using the TMS320 DSP Algorithm Standard in a Dynamic DSP System	SPRA580
TMS320C54x™ DSP CPU & Peripherals, Volume 1	SPRU131	Using the TMS320 DSP Algorithm Standard in a Static DSP System	SPRA577
TMS320C54x DSP Mnemonic Instruction Set, Volume 2	SPRU172	<b>White Paper</b>	
TMS320C54x DSP Algebraic Instruction Set, Volume 3	SPRU179	The Future of DSP	SPRY049
TMS320C54x DSP Enhanced Peripherals Guide, Volume 5	SPRU302		
TMS320C55x DSP CPU Reference Guide	SPRU371		
TMS320C55x DSP Algebraic Instruction Set Reference Guide	SPRU375		

Check the TI website for a complete listing of technical documentation including application notes.

**C5000 DSP Platform Support**

C5000 DSP Application Notes	<a href="http://www.ti.com/c5000appnotes">www.ti.com/c5000appnotes</a>
C5000 DSP Benchmarks	<a href="http://www.ti.com/c5000bench">www.ti.com/c5000bench</a>
C5000 DSP Foundation Software	<a href="http://www.ti.com/c5000dsplib">www.ti.com/c5000dsplib</a>



## Power Management Products

### Power Management Products for the C5000™ DSP Platform

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

Suggested Texas Instruments Power Management Solutions for the TMS320C55x™ DSP Generation					
DSP Part Number	LDO (Core Only)	LDO (I/O Only)	Buck Converter (Core Only)	Boost Converter w/ LDO <sup>1</sup>	Boost Converter (3.3 V) <sup>2</sup>
3.3-V I/O (Core)					
TMS320VC5510-200 (1.6 V)	TPS79401	TPS77033	TPS62204	TPS61100	TPS61030
TMS320VC5510-160 (1.6 V)	TPS79401	TPS77033	TPS62204	TPS61100	TPS61030
TMS320VC5509-200 (1.6 V)	TPS79401	TPS77033	TPS62204	TPS61100	TPS61030
TMS320VC5509-144 (1.6 V)	TPS79401	TPS77033	TPS62204	TPS61100	TPS61030
TMS320VC5502-300 (1.5 V)	TPS79401	TPS77033	TPS62200	TPS61100	TPS61030

Suggested Texas Instruments Power Management Solutions for the TMS320C54x™ DSP Generation					
DSP Part Number	LDO	LDO	Buck Converter	3.3-V Boost	Boost Converter
3.3-V I/O (Core)	(Core)	(I/O Only)	(Core)	Converter w/ LDO <sup>1</sup>	(3.3 V) <sup>2</sup>
TMS320VC5441-532 (1.5 V)	TPS79501	TPS77033	TPS62004	N/A	TPS43000
TMS320VC5420-200 (1.8 V)	TPS79318	TPS79133	TPS62202	TPS61121	TPS61030
TMS320VC5421-200 (1.8 V)	TPS79318	TPS77033	TPS62202	TPS61100	TPS61030
DSP Part Number	LDO	LDO	Buck Converter	3.3-V Boost	Boost Converter
Multicore (3.3-V I/O) (Core)	(Core)	(I/O Only)	(Core)	Converter w/ LDO <sup>1</sup>	(3.3 V) <sup>2</sup>
TMS320VC5410-100 (2.5 V)	TPS79325	TPS79133	TPS62205	TPS61100	TPS61030
TMS320VC5410A-120 (1.5 V)	TPS79301	TPS79133	TPS62201	TPS61100	TPS61030
TMS320VC5410A-160 (1.6 V)	TPS79301	TPS79133	TPS62204	TPS61100	TPS61030
TMS320VC5416-120 (1.5 V)	TPS79101	TPS77033	TPS62201	TPS61100	TPS61010
TMS320VC5416-160 (1.6 V)	TPS79301	TPS77033	TPS62204	TPS61100	TPS61030
TMS320VC5409A-160 (1.6 V)	TPS79301	TPS77033	TPS62204	TPS61100	TPS61030
TMS320VC5409A-120 (1.5 V)	TPS79101	TPS77033	TPS62201	TPS61100	TPS61010
TMS320VC5409-80 (1.8 V)	TPS79301	TPS79133	TPS62201	TPS61100	TPS61030
TMS320UC5409-80 (1.8 V)	TPS79118	TPS77033	TPS62202	TPS61100	TPS61010
TMS320VC5407-120 (1.5 V)	TPS79101	TPS77033	TPS62201	TPS61100	TPS61010
TMS320VC5404-120 (1.5 V)	TPS79101	TPS77033	TPS62201	TPS61100	TPS61010
TMS320VC5402A-160 (1.6 V)	TPS79101	TPS77033	TPS62204	TPS61100	TPS61010
TMS320VC5402-100 (1.8 V)	TPS79118	TPS77033	TPS62202	TPS61100	TPS61010
TMS320UC5402-80 (1.8 V)	TPS79118	TPS77033	TPS62202	TPS61100	TPS61010
TMS320VC5401-50 (1.8 V)	TPS79118	TPS77033	TPS62202	TPS61100	TPS61010
TMS320C54CST (1.5 V)	TPS79101	TPS77033	TPS62201	TPS61100	TPS61010
Supervised Voltage	1.2 V	1.5 V	1.6 V	1.8 V	2.5 V
Dual SVS <sup>3</sup>	TPS3110E12	TPS3110K33	TPS3106E16	TPS3305-18	TPS3305-25
Supply Voltage Supervisor	TPS3123J12	TPS3123G15	TPS3801-01	TPS3128E18	TPS3823-25
					TPS3823-33

Suggested Texas Instruments Power Management Solutions for the OMAP59xx Processors			
OMAP™ Part Number	Power Device	Description	Application Note
OMAP5910	TPS65010	Power and Battery Management Device	SPRA954A
OMAP5912	TPS65010	Power and Battery Management Device	SPRA954A

Note 1: Boost converter includes on chip LDO

Note 2: Converter listed can supply 3.3 V for additional circuitry, as well as  $V_{core}$  and  $V_{I/O}$

Note 3: Other supervised voltage is 3.3 V



## TMS320C64x™ DSP Generation, Fixed Point

Highest-Performance and Performance Value DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c6000](http://www.ti.com/c6000)

### Specifications

- Broadest portfolio of high performance DSPs ranging from \$20 to 1 GHz
- Shipping the industry's first 1-GHz DSPs on a 90-nm process node
- Upward 100% object code compatibility within C6000™ DSP platform
- The easiest to use integrated development environment with the industry's best optimizing C compiler

### Applications

Wireless Infrastructure (adaptive antennas, basestations, gateways), Telecom Infrastructure (RAS, PBX, VoIP), Digital Video (conferencing, surveillance, statistical remultiplexor/broadband routers), Imaging (medical, machine vision/inspection, defense/radar/sonar)

### Products

#### Performance Value DSPs:

**TMS320C6410/C6413 DSPs** – Low-cost for C64x™ DSP performance with up to 256-KBytes L2 memory

**TMS320C6412 DSP** – Low system cost through peripheral integration

- 32-bit PCI or 10/100-Mb Ethernet MAC
- 256-KBytes L2 memory

#### Highest-Performance DSPs:

**TMS320C6414T DSP** – Setting the industry's performance standard

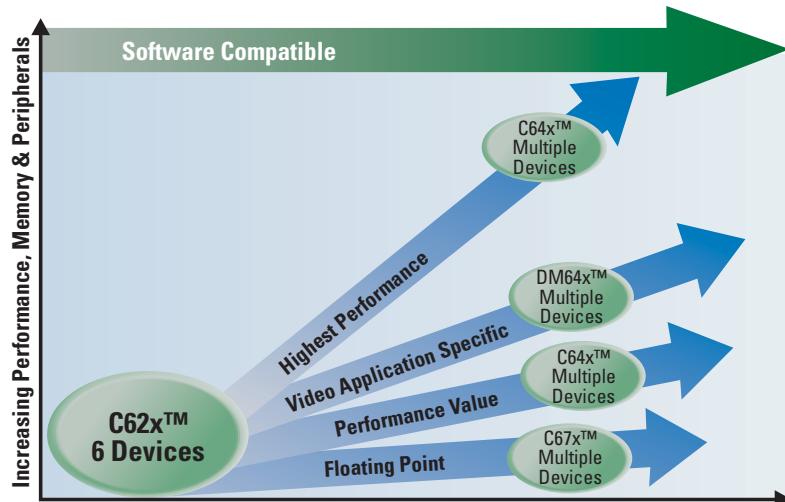
- Three multi-channel buffered serial ports (McBSPs)
- 32-bit host port interface (HPI)

**TMS320C6415T DSP** – Adds industry standard interfaces for multimedia and media gateway systems

- 32-bit/33-MHz PCI or 32-bit HPI
- Optional universal test and operations PHY interface for ATM (UTOPIA)

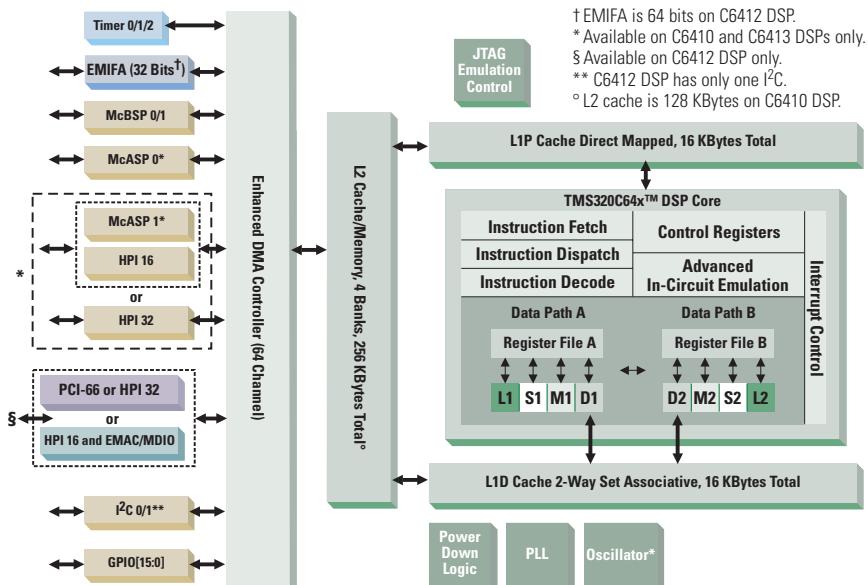
**TMS320C6416T DSP** – Features VITERBI decoder co-processor (VCP) and Turbo decoder co-processor (TCP)

**TMS320C6418 DSP** – Includes VCP and 512-KBytes L2 memory for communications applications



### C6000™ DSP Platform Roadmap

The C6000 DSP platform includes a wide range of devices that raise the bar in performance, set new levels of cost efficiency and offer on-chip peripheral integration to enable developers of high-performance systems to choose the device that best suits their specific application.



### TMS320C6410 / C6412 / C6413 DSP Block Diagram

Performance Value refers to lower price devices such as the C6410 and C6413 DSPs that provide a lower entry price for high-performance DSPs. Through its low system cost due to aggressive peripheral integration, the C6412 DSP also offers performance value. The C64x DSP generation's Performance Value vector complements the existing high-performance leadership TI has maintained for years with the C6000 DSP platform.



## Silicon

## TMS320C64x™ DSP Generation – Performance Value Fixed-Point DSPs

Part Number	Internal RAM (Bytes)	L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McBSP	Enhanced DMA (Channels)	COM°	Timers	MHz	MIPS	Power (W)*		Voltage (V)	Core	I/O	Packaging	1 KU (\$U.S.)†
	CPU and L1								Total						
<b>Performance Value</b>															
TMS320C6410GTS400	16K/16K/128K	2	64		HPI 32/16	3	400	3200	0.4	1.0	1.2	3.3	288 BGA, 23 mm	20.28	
TMS320C6413GTS500	16K/16K/256K	2	64		HPI 32/16	3	500	4000	0.4	1.0	1.2	3.3	288 BGA, 23 mm	32.71	
TMS320C6412GDK500	16K/16K/256K	2	64		PCI/HPI/EMAC†	3	500	4000	0.4	1.0	1.2	3.3	548 BGA, 23 mm	42.89	
TMS320C6412GNZ500	16K/16K/256K	2	64		PCI/HPI/EMAC†	3	500	4000	0.4	1.0	1.2	3.3	548 BGA, 27 mm	42.89	
TMS320C6412GDK600	16K/16K/256K	2	64		PCI/HPI/EMAC†	3	600	4800	0.6	1.5	1.4	3.3	548 BGA, 23 mm	48.25	
TMS320C6412GNZ600	16K/16K/256K	2	64		PCI/HPI/EMAC†	3	600	4800	0.6	1.5	1.4	3.3	548 BGA, 27 mm	48.25	

\* HPI is selectable, 32-bit or 16-bit.

† The C6412 can be configured to have either a 32-bit PCI or 32-bit HPI, or a 16-bit HPI with Ethernet MAC.

‡ Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

\* Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 75-MHz timers at 100% utilization. See SPRA811.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

## TMS320C64x™ DSP Generation – Highest-Performance Fixed-Point DSPs

Part Number	Internal RAM (Bytes)	L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McBSP	Enhanced DMA (Channels)	COM°	Timers	MHz	MIPS	Power (W)*		Voltage (V)	Core	I/O	Packaging	1 KU (\$U.S.)†
	CPU and L1								Total						
<b>Highest Performance</b>															
TMS320C6418GTS600	16K/16K/512K	2	64		HPI 32/16	3	600	4800‡	0.6	1.5	1.4	3.3	288 BGA, 23 mm	55.94	
TMS320C6414TGLZ6#	16K/16K/1M	3	64		HPI 32/16	3	600	4800	0.6	1.5	1.1	3.3	532 BGA, 23 mm	85.85	
TMS320C6414TGLZ7#	16K/16K/1M	3	64		HPI 32/16	3	720	5760	0.6	1.7	1.2	3.3	532 BGA, 23 mm	107.32	
TMS320C6414TGLZ8#	16K/16K/1M	3	64		HPI 32/16	3	850	6800	TBD	TBD	1.2	3.3	532 BGA, 23 mm	170.69	
TMS320C6414TGLZ1	16K/16K/1M	3	64		HPI 32/16	3	1000	8000	TBD	TBD	1.2	3.3	532 BGA, 23 mm	213.63	
TMS320C6415TGLZ6#	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	600	4800	0.6	1.5	1.1	3.3	532 BGA, 23 mm	90.37	
TMS320C6415TGLZ7#	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	720	5760	0.6	1.7	1.2	3.3	532 BGA, 23 mm	112.97	
TMS320C6415TGLZ8#	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	850	6800	TBD	TBD	1.2	3.3	532 BGA, 23 mm	179.67	
TMS320C6415TGLZ1	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	1000	8000	TBD	TBD	1.2	3.3	532 BGA, 23 mm	224.87	
TMS320C6416TGLZ6#	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	600	4800**	0.6	1.5	1.1	3.3	532 BGA, 23 mm	99.41	
TMS320C6416TGLZ7#	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	720	5760**	0.6	1.7	1.2	3.3	532 BGA, 23 mm	124.26	
TMS320C6416TGLZ8#	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	850	6800**	TBD	TBD	1.2	3.3	532 BGA, 23 mm	197.64	
TMS320C6416TGLZ1	16K/16K/1M	2+Utopia*	64		PCI/HPI 32/16	3	1000	8000**	TBD	TBD	1.2	3.3	532 BGA, 23 mm	247.36	

\*\* Plus on-chip Turbo (TCP) and VITERBI (VCP) coprocessors.

† Plus on-chip VITERBI (VCP) coprocessor.

\* UTOPIA pins muxed with a third McBSP.

\* HPI is selectable, 32-bit or 16-bit.

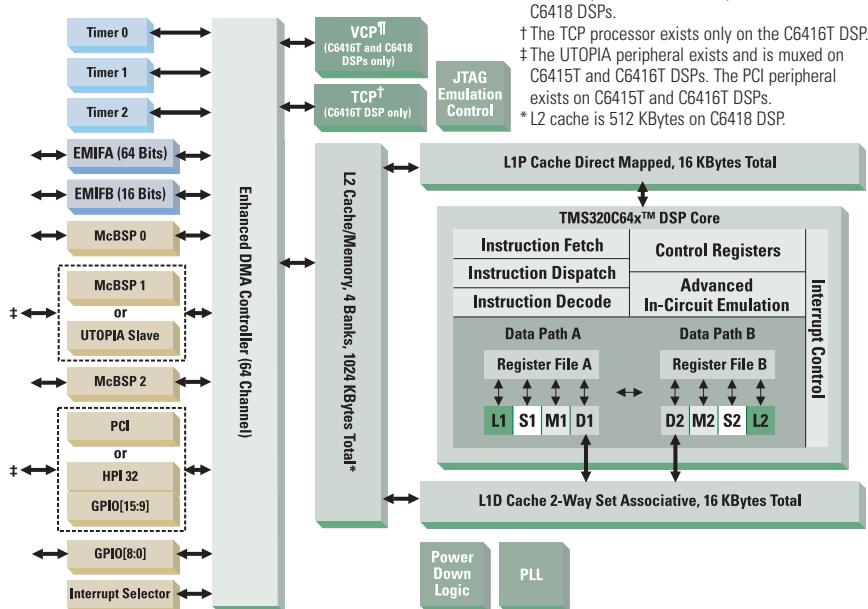
\* Extended temperature versions available for C6414T, C6415T and C6416T at 600, 720 and 850 MHz for additional charge.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

\* Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

\* Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 75-MHz timers at 100% utilization. See SPRA811.

For details on TMS320DM64x™ digital media processors for video and imaging applications, go to page 14.



**TMS320C6414T / C6415T / C6416T / C6418 DSP Block Diagram**

With the highest-performance devices in the industry (up to 1 GHz based on 90-nm process technology), each C64x DSP is specifically designed to meet your needs by offering multiple peripheral options, and price points, code compatibility and scalability.

## Independent Benchmarks for Highest-Performance DSPs

The 1-GHz TMS320C64x™ DSP devices (TMS320C6414T / C6415T / C6416T) have been evaluated by Berkeley Design Technology, Inc. (BDTI), an independent provider of signal-processing technology analysis. The 1-GHz C64x™ DSP devices received a BDTImark2000™ score of 9130, which is the highest score BDTI has published for a mainstream DSP to date. The 720-MHz C64x DSP devices achieve a BDTImark2000 score of 6570.

(The BDTImark2000 provides a summary measure of DSP speed. For more information and scores, please see [www.BDTI.com](http://www.BDTI.com). Score © 2004 BDTI.)

## Independent Telecom Benchmarks for Performance Value DSPs

The Embedded Microprocessor Benchmark Consortium (EEMBC®) has conducted benchmarking for the new TMS320C6413 DSP, part of the Performance Value vector on our C6000™ roadmap. When analyzed on a performance per dollar basis, the C6413 DSP has achieved an impressive result of nine Telemarks per dollar. (Note: The C6413 DSP is priced at U.S. \$28.95 in 10 KU quantities.)

The TMS320C6413 DSP (500 MHz) was evaluated by two categories of benchmarking. In an out-of-the-box C-compiler test, the C6413 DSP achieved a score of

13.5 Telemarks, comparing very favorably with standard RISC processors. However, the real benefits of this highly parallel architecture are demonstrated after employing C-level optimizations, where the score jumped to 263.3 Telemarks.

The EEMBC benchmarks use an application-specific set of benchmarking code to allow microprocessors from many manufacturers to be compared in out-of-the-box C, optimized C and full fury configurations.

The out-of-the-box score is the maximum performance result that can be obtained

by compiling the benchmark C code without any modifications at all. All that is allowed is the changing of compiler settings.

The optimized C scores use pragmas and intrinsics to more fully realize the performance of the DSP in the C environment. The pragmas deliver more information to the compiler such as loop count information used for loop unrolling and data alignment. The intrinsics provide access to DSP instructions/functionality not easily expressed in the typical C runtime environment such as saturated arithmetic.

Before a processor's scores are published, the EEMBC Certification Laboratories (ECL) must execute and verify the benchmarks. ECL certification ensures that scores are repeatable and generated fairly in accordance with EEMBC's rules.

## TMS320C6000™ DSP Platform Benchmarks – EEMBC® Telemarks

TI Processor	Out-of-the-Box	Optimized C
TMS320C64x DSP at 1 GHz	27.1	526.5
TMS320C64x DSP at 720 MHz	19.5	379.1
TMS320C6413 DSP at 500 MHz	13.5	263.3
TMS320C62x™ DSP at 300 MHz	6.8	44.6

## Silicon

### TMS320C62x™ DSP Generation, Fixed Point TMS320C67x™ DSP Generation, Floating Point

#### High-Performance DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c6000](http://www.ti.com/c6000)

#### Specifications

- 100% code-compatible DSPs priced as low as \$9:
  - Fixed-point C62x™ DSP – 16-bit multiply, 32-bit instructions
  - Floating-point C67x™ DSP – 32-bit instructions, single and double precision
- Four data memory access (DMA) channels with bootloading capability (enhanced DMA with 16 channels for C6211, C6711, C6712 and C6713 DSPs)
- Up to 7 Mbit on-chip memory
- Two multi-channel buffered serial ports (McBSPs) (three McBSPs for C6202 and C6203 DSPs)
- 16-bit host-port interface (HPI) (32-bit Expansion Bus for C6202, C6203 and C6204 DSPs)
- Two 32-bit timers
- 32-bit PCI interface (C6205 DSP only)
- Up to 2400 MIPS at 300 MHz (C6203 DSP)

#### C67x DSP:

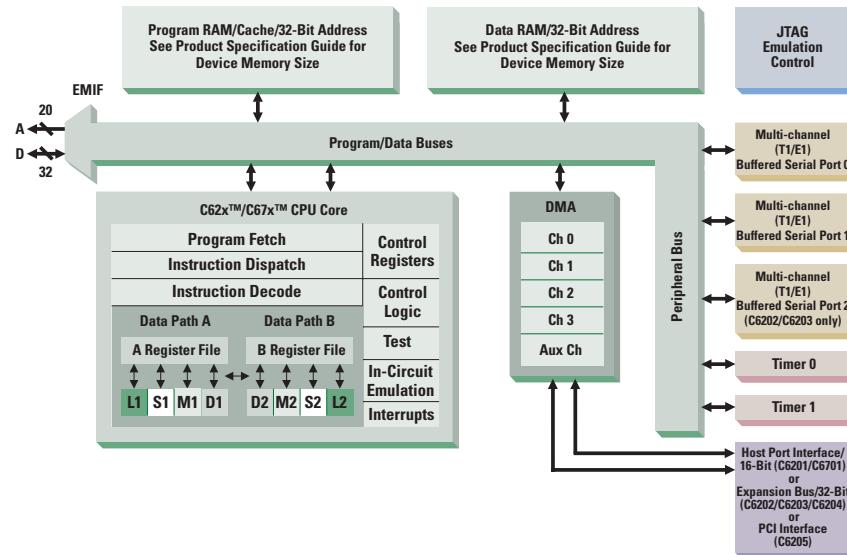
- IEEE floating-point format
- Up to 1800 MFLOPS at 300 MHz
- Two new multi-channel audio serial ports (McASP) (C6713 DSP) can support up to 16 stereo channels of I<sup>2</sup>S and are compatible with S/PDIF transmit protocol

#### Applications

Pooled modems, digital subscriber line (xDSL), wireless basestations, central office switches, Private Branch Exchange (PBX), digital imaging, digital audio, call processing, 3D graphics, speech recognition, voice over packet

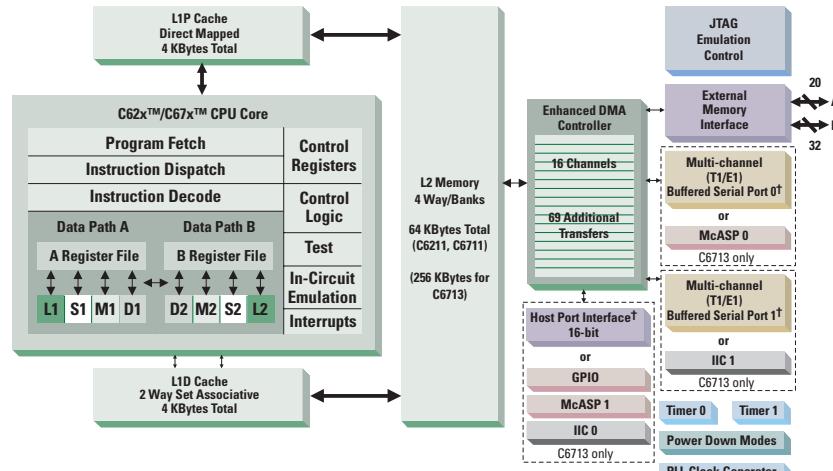
#### Features

- Advanced VLIW architecture
- Up to eight 32-bit instructions executed each cycle
- Eight independent, multi-purpose functional units and thirty-two 32-bit registers
- Industry's most advanced DSP C compiler and Assembly Optimizer maximize efficiency and performance



#### TMS320C6201 / C6701 / C6202 / C6203 / C6204 / C6205 DSP Block Diagram

The fixed-point C6201 DSP is pin-for-pin compatible with the floating-point C6701 DSP offering easy code transfer resulting in significant savings in development, resource and manufacturing costs. Pin compatibility between the C6202, C6203 and C6204 DSPs allow for easy migration between several memory, price and performance options. The C6205 DSP is the first TI DSP with on-chip PCI.



#### TMS320C6211 / C6711 / C6712\* / C6713 DSP Block Diagram

The C6211 and C6711 DSPs' innovative two-level cache memory structure enables a breakthrough in system cost/performance. \*The C6712 DSP features a 16-bit EMIF and no HPI. All C621x and C671x devices are pin compatible. The C6713 DSP is a superset of the C6711 DSP and includes I<sup>2</sup>S, I<sup>2</sup>C and S/PDIF transmit support as well as enhanced memory space.



## TMS320C62x™ DSP Generation – Fixed-Point DSPs

Part Number	RAM (Bytes)		McBSP	DMA	COM	MHz	Cycle (ns)	MIPS	Typical Activity		Voltage (V)	Packaging	1 KU (\$U.S.) <sup>+</sup>
	Data	Prog							Total Internal Power (W) (Full Device Speed)	Core	I/O		
TMS320C6204GHK200 <sup>#</sup>	64K	64K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	9.66
TMS320C6204GLW200	64K	64K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	340 BGA, 18 mm	21.90
TMS320C6205GHK200 <sup>#</sup>	64K	64K	2	4	PCI/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	10.43
TMS320C6211BGFN150 <sup>#</sup>	4K/4K/64K*	2	16 <sup>†</sup>	HPI/16	150	6.7	1200	0.9	1.8	3.3	256 BGA, 27 mm	22.54	
TMS320C6211BGFN167	4K/4K/64K*	2	16 <sup>†</sup>	HPI/16	167	6	1336	1.0	1.8	3.3	256 BGA, 27 mm	28.18	
TMS320C6202BGNZ250 <sup>#</sup>	128K	256K	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	352 BGA, 27 mm	58.57
TMS320C6202BGNY250	128K	256K	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	384 BGA, 18 mm	58.57
TMS320C6202BGNZ300	128K	256K	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	352 BGA, 27 mm	70.29
TMS320C6202BGNY300	128K	256K	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	384 BGA, 18 mm	70.29
TMS320C6203BGNZ300	512K	384K	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	352 BGA, 27 mm	74.96
TMS320C6203BGNY300	512K	384K	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	384 BGA, 18 mm	74.96
TMS320C6203BGNZ173 <sup>#</sup>	512K	384K	3	4	Exp. Bus/32	173	4	1384	1.1	1.5 <sup>°</sup>	3.3	352 BGA, 27 mm	63.26
TMS320C6203BGNY173	512K	384K	3	4	Exp. Bus/32	173	4	1384	1.1	1.5 <sup>°</sup>	3.3	384 BGA, 18 mm	63.26
TMS320C6201GJC200 <sup>#</sup>	64K	64K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 35 mm	86.57
TMS320C6201GJL200 <sup>#</sup>	64K	64K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 27 mm	86.57

\* The C6211 DSP's 72 KBytes of cache memory is comprised of 4 KBytes data cache, 4 KBytes program cache and 64 KBytes unified cache memory.

<sup>†</sup> Enhanced DMA.

<sup>#</sup> Extended temperature versions available for C6201, C6202, C6203, C6204, C6205 and C6211 for additional charge.

<sup>°</sup> Device may operate at 300 MHz with 1.7-V core.

<sup>+</sup> Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

Note: All devices include two timers.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

## TMS320C67x™ DSP Generation – Floating-Point DSPs

Part Number	RAM (Bytes)		McBSP	DMA	COM	MHz	Cycle (ns)	MFLOPS	Typical Activity		Voltage (V)	Packaging	1 KU (\$U.S.) <sup>+</sup>
	Data/Prog	McBSP							Total Internal Power (W) (Full Device Speed)	Core	I/O		
TMS320C6712DGD150	4K/4K/64K*	2	16 <sup>°</sup>	—		150	6.7	900	0.7	1.2	3.3	272 BGA, 27 mm	46.52
TMS320C6711DGD200	4K/4K/64K*	2	16 <sup>°</sup>	HPI/16		200	5	1200	0.9	1.2	3.3	272 BGA, 27 mm	18.02
TMS320C6713BYP200	4K/4K/256K*	2 <sup>#</sup>	16 <sup>°</sup>	HPI/16		200	5	1200	1.0	1.2	3.3	208 TQFP, 28 mm	21.07
TMS320C6713BGDP225	4K/4K/256K*	2 <sup>#</sup>	16 <sup>°</sup>	HPI/16		225	4.4	1350	1.2	1.2	3.3	272 BGA, 27 mm	27.68
TMS320C6713BGDP300	4K/4K/256K*	2 <sup>#</sup>	16 <sup>°</sup>	HPI/16		300	3.3	1800	TBD	1.4	3.3	272 BGA, 27 mm	36.82
TMS320C6701GJC150	64K/64K	2	4	HPI/16		150	6.7	900	1.3	1.8	3.3	352 BGA, 35 mm	82.24
TMS320C6701GJC16719V	64K/64K	2	4	HPI/16		167	6	1000	1.4	1.9	3.3	352 BGA, 35 mm	124.66

\* Format represents cache memory architecture: [data cache] / [program cache] / [unified cache]

<sup>°</sup> Enhanced DMA.

<sup>#</sup> Extended temperature version available for C6711D for additional charge.

Note: All devices include two timers.

<sup>°</sup> The C6713 DSP can be configured to have up to three serial ports in various McBSP/McASP combinations by not utilizing the HPI. Other configurable serial options include I<sup>2</sup>C and additional GPIO.

<sup>+</sup> Prices are quoted per unit in U.S. dollars at 1 KU quantities. Prices represent year 2005 suggested resale pricing.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.



## Tools, Software and Support

### C6000™ DSP Platform Hardware and Software Development Tools

Description	Part Number	\$U.S.†
<b>Hardware Development Tools<sup>‡</sup></b>		
TMS320C6713 DSP Starter Kit (DSK)	TMDSDSK6713 (U.S. part number) TMDSDSK6713-0E (European part number)	395
TMS320C6416 DSP Starter Kit (DSK)	TMDXDSK6416-T (U.S. part number) TMDXDSK6416-TE (European part number)	495
Fingerprint Authentication Development Tool	TMDSFDCFPC10	245
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
C6000 DSP Code Composer Studio™ Development Tools <sup>§</sup> Bundled with Annual Software Subscription Supports C62x™, C67x™, DM64x™ and C64x™ DSP products	TMDSCCS6000-1	3,595
C6000 DSP Code Composer Studio Development Tools Annual Software Subscription	TMDSSUB6000	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000™ DSP Code Composer Studio 90-Day Free Evaluation Tools <sup>‡</sup>	SPRC119B ( <a href="http://www.dspvillage.ti.com/freetools">www.dspvillage.ti.com/freetools</a> )	Free
TMS320C6000 DSP Chip Support Library	SPRC090	Free
TMS320C62x™ DSP Library	SPRC091	Free
TMS320C62x DSP Image Library	SPRC093	Free
TMS320C64x™ DSP Library	SPRC092	Free
TMS320C64x DSP Image Library	SPRC094	Free
TMS320C67x™ DSP Library	SPRC121	Free
TMS320C67x DSP Fast Run-Time Support Library (Fast RTS)	SPRC060	Free

<sup>†</sup> Prices are quoted in U.S. dollars and represent year 2005 suggested resale pricing.

<sup>‡</sup> A TMS320C6413 EVM is available from Spectrum Digital ([www.spectrumdigital.com](http://www.spectrumdigital.com)), Spectrum Digital part number 701884.

<sup>§</sup> Includes Code Composer Studio Development Tools, DSP/BIOS kernel, code generation tools (C/C++ compiler/assembler/linker) with 256K limited application size, RTDX, EVM board with device drivers and profile-based compiler.

<sup>¶</sup> Includes Code Composer Studio Development Tools, DSP/BIOS™, code generation tools (C/C++ compiler/assembler/linker), XDS510™ and XDS560™ device drivers (emulation software), RTDX™, simulator and profile-based compiler. Please see the features supported by platform matrix on page 60 for more details.

<sup>‡</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 90 days.

### C6000™ DSP Platform Tools and Software Documentation

Software Reference Guides	Web Search Literature #	Software Reference Guides (Cont'd)	Web Search Literature #
TMS320C6000 DSP Optimizing C Compiler User's Guide	SPRU187	TMS320C6000 DSP/BIOS Application Programming Interface (API) Reference Guide	SPRU403
Debugger User's Guide	SPRU188	TMS320C6000 DSP Instruction Set Simulator	SPRU546
TMS320C6000 DSP Programmer's Guide	SPRU198	Code Coverage and Multi-Event Profiler User's Guide	SPRU624
TMS320C6000 DSP Assembly Language Tools User's Guide	SPRU186	TMS320C62x DSP Library Programmer's Reference	SPRU402
Code Composer Studio Getting Started Guide	SPRU509	TMS320C64x DSP Library Programmer's Reference	SPRU565
TMS320C67x DSP Library Programmer's Reference Guide	SPRU657	TMS320C64x DSP Image/Video Processing Library Programmer's Ref.	SPRU023
TMS320C6000 DSP Peripheral Support Library Programmer's Ref. Guide	SPRU273	TMS320C67x DSP Fast RTS Library User's Guide	SPRU100
TMS320C6000 DSP Chip Support Library API Reference Guide	SPRU401	<b>Product Bulletin</b>	
TMS320C6000 DSP DSK Board Support Library API User's Guide	SPRU432	XDS560™ Emulator Product Bulletin	SPRB148
TMS320C62x DSP Image/Video Library Programmer's Reference	SPRU400		
TMS320™ DSP/BIOS™ User's Guide	SPRU423		

Check the TI website for a complete listing of technical documentation including application notes.

**C6000™ DSP and TMS320™ DSP Algorithm Standard Literature and Related Technical Documentation**

Data Sheets	Web Search Literature #	Software User's and Reference Guides	Web Search Literature #
TMS320C6201 DSP Data Sheet	SPRS051	TMS320C6000 DSP Programmer's Guide	SPRU198
TMS320C6202/TMS320C6202B DSP Data Sheet	SPRS104	Turbo Decoder Coprocessor User's Guide	SPRU534
TMS320C6203 DSP Data Sheet	SPRS086	TMS320C64x DSP VITERBI Decoder Coprocessor Reference Guide	SPRU533
TMS320C6204 DSP Data Sheet	SPRS152	Cache Analysis User's Guide	SPRU575
TMS320C6205 DSP Data Sheet	SPRS106	TMS320™ DSP Algorithm Standard Rules and Guidelines	SPRU352
TMS320C6211/TMS320C6211B DSP Data Sheet	SPRS073	TMS320 DSP Algorithm Standard API Reference	SPRU360
TMS320C6701 DSP Data Sheet	SPRS067	TMS320 DSP Algorithm Standard Demonstration Application	SPRU361
TMS320C6711/TMS320C6711B DSP Data Sheet	SPRS088	TMS320 DSP Algorithm Standard Developer's Guide	SPRU424
TMS320C6712 DSP Data Sheet	SPRS148	<b>Product Bulletins</b>	
TMS320C6713 DSP Data Sheet	SPRS186	TMS320C64x DSP Product Bulletin	SPRT236
TMS320C6410 DSP Data Sheet	SPRS247	TMS320C67x™ Floating-Point DSP Generation Product Bulletin	SPRT196
TMS320C6412 DSP Data Sheet	SPRS219	<b>Application Notes</b>	
TMS320C6413 DSP Data Sheet	SPRS247	How to Begin Development Today with the C6414, C6415, and C6416 DSPs	SPRA718
TMS320C6414T/C6415T/C6416T DSP Data Sheet	SPRS226	How to Begin Development Today with the C6713 Floating-Point DSP	SPRA809
TMS320C6418 DSP Data Sheet	SPRS241	TMS320C6414, C6415, and C6416 DSP Power Consumption Summary	SPRA811
<b>Technical Briefs and Overviews</b>		Migrating from TMS320C6211B/TMS320C6711B to TMS320C6711C DSPs	SPRA837
TMS320C6000 DSP Technical Brief	SPRU197	TMS320C6713 Digital Signal Processor Optimized for High-Performance Multichannel Audio Systems	SPRA921
TMS320C64x™ DSP Technical Overview	SPRU395	A Case Study in DSP Systems Integration – The TI 3rd Party Vocoder Demonstration	SPRA734
<b>Hardware User's Guides</b>		Making DSP Algorithms Compliant with the TMS320 DSP Algorithm Standard	SPRA579
TMS320C6000 DSP CPU and Instruction Set Reference Guide	SPRU189	The TMS320 DSP Algorithm Standard – White Paper	SPRA581
TMS320C6000 DSP Peripherals Reference Guide	SPRU190	Using the TMS320 DSP Algorithm Standard in a Dynamic DSP System	SPRA580
TMS320C62x™/C64x™ DSP FastRTS Library Programmer's Reference Guide	SPRU653	Using the TMS320 DSP Algorithm Standard in a Static DSP System	SPRA577
TMS320C6000 DSP Instruction Set Simulator Technical Overview	SPRU600	<b>White Papers</b>	
TMS320C6000 DSP Multi-channel Audio Serial Port (McASP) Reference Guide	SPRU041	The Future of DSP	SPRY049
TMS320C6000 DSP I²C Module Reference Guide	SPRU175	Comparing Apples, Oranges and Gigahertz: Why is a DSP Gigahertz so Special?	SPRY050
TMS320C6000 DSP Phase-Locked Loop (PLL) Controller Peripheral Reference Guide	SPRU233		

Check the TI website for a complete listing of technical documentation including application notes.

**C6000 DSP Platform Support**

C6000 DSP Application Notes	<a href="http://www.ti.com/c6000appnotes">www.ti.com/c6000appnotes</a>
C6000 DSP Benchmarks	<a href="http://www.ti.com/c6000bench">www.ti.com/c6000bench</a>
C6000 DSP Signal Processing Libraries	<a href="http://www.ti.com/c6000dsplib">www.ti.com/c6000dsplib</a>



## Power Management Products

### Power Management Products for the C6000™ DSP Platform

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

#### Suggested Power Management Solutions for the TMS320C64x™ DSP Generation

DSP Part Number	Core LDO	Core Switcher (w/ FETs)	Core Plug-In Module	Dual Plug-In Module	I/O LDO	I/O Switcher (w/ FETs)
3.3-V I/O (Core)						
TMS320C6414-500 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320C6414-600 (1.4 V)	TPS78601	TPS54110	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320C6415-500 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320C6415-600 (1.4 V)	TPS78601	TPS54110	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320C6416-500 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320C6416-600 (1.4 V)	TPS78601	TPS54110	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320DM642-500 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007
TMS320DM642-600 (1.4 V)	TPS78601	TPS54110	PTHxx000W <sup>1</sup>	PT6940	TPS77333	TPS62007

#### Suggested Power Management Solutions for the TMS320C62x™ DSP Generation

DSP Part Number	Core LDO	Core Switcher (w/ FETs)	Core Plug-In Module	Dual Plug-In Module	I/O LDO	I/O Switcher (w/ FETs)
3.3-V I/O (Core)						
TMS320C6201-200 (1.8 V)	TPS75118	TPS54110	PTHxx000W <sup>1</sup>	PT6942	TPS77333	TPS62007
TMS320C6202-200 (1.8 V)	TPS75418	TPS54110	PTHxx050W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6202-250 (1.8 V)	TPS75418	TPS54110	PTHxx050W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6202B-250 (1.5 V)	TPS75101	TPS54110	PTHxx000W <sup>1</sup>	PT6943	TPS77133	TPS62007
TMS320C6202B-300 (1.5 V)	TPS75115	TPS54110	PTHxx000W <sup>1</sup>	PT6943	TPS77133	TPS62007
TMS320C6203B-250 (1.5 V)	TPS76815	TPS62040	PTHxx000W <sup>1</sup>	PT6943	TPS77133	TPS62007
TMS320C6203B-300 (1.5 V)	TPS75101	TPS54110	PTHxx000W <sup>1</sup>	PT6943	TPS77133	TPS62007
TMS320C6204-200 (1.5 V)	TPS76815	TPS62040	PTHxx000W <sup>1</sup>	PT6943	TPS77333	TPS62007
TMS320C6205-200 (1.5 V)	TPS76815	TPS62040	PTHxx000W <sup>1</sup>	PT6943	TPS77333	TPS62007
TMS320C6211B-150 (1.8 V)	TPS77818	TPS62050	PTHxx050W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6211B-167 (1.8 V)	TPS77818	TPS62050	PTHxx050W <sup>1</sup>	PT6942	TPS77133	TPS62007

#### Suggested Power Management Solutions for the TMS320C67x™ DSP Generation

DSP Part Number	Core LDO	Core Switcher (w/ FETs)	Core Plug-In Module	Dual Plug-In Module	I/O LDO	I/O Switcher (w/ FETs)
3.3-V I/O (Core)						
TMS320C6701-150 (1.8 V)	TPS75118	TPS54110	PTHxx000W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6701-167 (1.9 V)	TPS75101	TPS54110	PTHxx000W <sup>1</sup>	PT6940	TPS77133	TPS62007
TMS320C6711-100 (1.8 V)	TPS76818	TPS62040	PTHxx000W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6711-150 (1.8 V)	TPS76818	TPS62040	PTHxx000W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6711B-100 (1.8 V)	TPS76818	TPS62040	PTHxx000W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6711B-150 (1.8 V)	TPS76818	TPS62040	PTHxx000W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6711C-200 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77133	TPS62007
TMS320C6711D-200 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77133	TPS62007
TMS320C6712-100 (1.8 V)	TPS77818	TPS62050	PTHxx050W <sup>1</sup>	PT6942	TPS77133	TPS62007
TMS320C6712C-150 (1.2 V)	TPS79601	TPS62050	PTHxx050W <sup>1</sup>	PT6940	TPS77133	TPS62007
TMS320C6712C-150 (1.2 V)	TPS79601	TPS62050	PTHxx050W <sup>1</sup>	PT6940	TPS77133	TPS62007
TMS320C6713-200 (1.2 V)	TPS79601	TPS62040	PTHxx000W <sup>1</sup>	PT6940	TPS77133	TPS62007
TMS320C6713-225 (1.2 V)	TPS78601	TPS54110	PTHxx000W <sup>1</sup>	PT6940	TPS77133	TPS62007

Note 1: xx is determined by input bus voltage:  $V_{IN} = 12\text{ V}$  then  $xx = 12$ ,  $V_{IN} = 5\text{ V}$  then  $xx = 05$ , and  $V_{IN} = 3.3\text{ V}$  then  $xx = 03$ .

## DSP-Sync™ FIFO Products

**TI DSP-Sync FIFO Products**

- Industry's fastest 3.3-V FIFOs fully optimize DSP performance in high-bandwidth telecom and internetworking applications by eliminating data bottlenecks

**TMS320C6000™ DSP****Applications**

- Network security cameras
- Wireless LAN
- Streaming video servers
- Remote Access Servers (RAS)
- Wireless basestations
- Digital Subscriber Lines (xDSL)
- Medical and industrial imaging
- Multi-channel telephony
- Gigabit Ethernet routers
- ATM switches
- SONET/ATM multiplexers
- Broadband video transcoders

**TMS320C5000™ DSP****Applications**

- Digital still cameras
- Digital audio players
- Digital media processing
- Networking
- Industrial controls
- Voice recognition
- Biometrics
- Automotive
- Enhanced gaming

**Features and Benefits**

- Provide DSP glueless interface to TI's TMS320 DSPs
- Allow both first-word and standard fall-through timing
- Offer fully programmable flags

**TI DSP-Sync FIFOs for all TMS320 DSP Platforms**

Device	Description	Package	Supply Voltage (V)	Max Clock Freq (MHz)	Access Time (ns)	1 KU (\$U.S.) <sup>†</sup>
SN74V215	512 × 18, Sync FIFO	64 TQFP	3.3	133	5	3.92
SN74V225	1K × 18, Sync FIFO	64 TQFP	3.3	133	5	4.44
SN74V235	2K × 18, Sync FIFO	64 TQFP	3.3	133	5	5.04
SN74V245	4K × 18, Sync FIFO	64 TQFP	3.3	133	5	5.54
SN74V263	8K × 18/16K × 9, Sync FIFO	80 TQFP 100 BGA	3.3	166	4.5	14.28
SN74V273	16K × 18/32K × 9, Sync FIFO	80 TQFP 100 BGA	3.3	166	4.5	15.55
SN74V283	32K × 18/64K × 9, Sync FIFO	80 TQFP 100 BGA	3.3	166	4.5	16.84
SN74V293	64K × 18/128K × 9, Sync FIFO	80 TQFP 100 BGA	3.3	166	4.5	18.12
SN74V3640	1K × 36, Sync FIFO	128 TQFP	3.3	166	4.5	12.04
SN74V3650	2K × 36, Sync FIFO	128 TQFP	3.3	166	4.5	13.10
SN74V3660	4K × 36, Sync FIFO	128 TQFP	3.3	166	4.5	14.28
SN74V3670	8K × 36, Sync FIFO	128 TQFP	3.3	166	4.5	15.56
SN74V3680	16K × 36, Sync FIFO	128 TQFP	3.3	166	4.5	16.84
SN74V3690	32K × 36, Sync FIFO	128 TQFP	3.3	166	4.5	18.12

<sup>†</sup> Prices are quoted in U.S. dollars and represent year 2005 suggested resale pricing for the fastest available device. For a complete list of TI FIFO devices, please see our website at [www.ti.com/sc/fifo](http://www.ti.com/sc/fifo)



## MSP430 Microcontrollers: Ultra-Low-Power, 16-Bit RISC

## Key Features

- Ultra-low-power architecture extends battery life:
  - 0.1  $\mu$ A RAM retention
  - 0.8  $\mu$ A real-time clock mode
  - 250  $\mu$ A/MIPS active
- High-performance analog ideal for precise measurement
- Modern 16-bit RISC CPU enables new applications at a fraction of the code size
- In-system programmable Flash permits flexible code changes, field upgrades and data logging
- Complete integrated development environment starting at U.S. \$49
- Device pricing as low as U.S. \$0.49

## Key Applications

- Utility metering
- Portable instrumentation
- Intelligent sensing

## MSP-FET430 Flash Emulation Tool

- JTAG-based real-time in-system emulation
- Target board, interface box, cable and samples
- CD-ROM includes Kickstart IDE, assembler, linker, simulator and 4-KB C-compiler

The Flash Emulation Tool (FET) supports complete in-system development and is available for all the MSP430 Flash devices. Programming, assembler/C source-level debug, single stepping, multiple hardware breakpoints, full-speed operation and peripheral access are all fully supported in-system using JTAG. The FET comes complete with everything required to complete an entire project for only U.S. \$99.

## Suggested Power Management Solution

- TPS797xx – 10-mA micropower LDO voltage regulator in SC-70 package

(C) ROM (F) Flash	Program	SRAM	I/O	DMA	Timer_A 16-Bit No. of C/C <sup>1</sup>	Timer_B 16-Bit No. of C/C <sup>1</sup>
<b>Flash/ROM-Based F1xx Family with 16-Bit Watchdog (V<sub>CC</sub> 1.8–3.6 V)</b>						
MSP430F1101A	1 KB	128	14	—	3	—
MSP430C1101	1 KB	128	14	—	3	—
MSP430F1111A	2 KB	128	14	—	3	—
MSP430C1111	2 KB	128	14	—	3	—
MSP430F1121A	4 KB	256	14	—	3	—
MSP430C1121	4 KB	256	14	—	3	—
MSP430F1122	4 KB	256	14	—	3	—
MSP430F1132	8 KB	256	14	—	3	—
MSP430F122	4 KB	256	22	—	3	—
MSP430F123	8 KB	256	22	—	3	—
MSP430F1222	4 KB	256	22	—	3	—
MSP430F1232	8 KB	256	22	—	3	—
MSP430F133	8 KB	256	48	—	3	3
MSP430C1331	8 KB	256	48	—	3	3
MSP430F135	16 KB	512	48	—	3	3
MSP430C1351	16 KB	512	48	—	3	3
MSP430F147	32 KB	1024	48	—	3	7
MSP430F1471	32 KB	1024	48	—	3	7
MSP430F148	48 KB	2048	48	—	3	7
MSP430F1481	48 KB	2048	48	—	3	7
MSP430F149	60 KB	2048	48	—	3	7
MSP430F1491	60 KB	2048	48	—	3	7
MSP430F155	16 KB	512	48	✓	3	3
MSP430F156	24 KB	1024	48	✓	3	3
MSP430F157	32 KB	1024	48	✓	3	3
MSP430F167	32 KB	1024	48	✓	3	7
MSP430F168	48 KB	2048	48	✓	3	7
MSP430F169	60 KB	2048	48	✓	3	7
MSP430F1610	32 KB	5120	48	✓	3	7
MSP430F1611	48 KB	10240	48	✓	3	7
MSP430F1612	55 KB	5120	48	✓	3	7
(C) ROM (F) Flash	Program	SRAM	I/O	DMA	Timer_A 16-Bit No. of C/C <sup>1</sup>	Timer_B 16-Bit No. of C/C <sup>1</sup>
<b>Flash/ROM-Based F2xx Family With 16 MIPS and 16-Bit Watchdog (V<sub>CC</sub> 1.8–3.6 V)</b>						
MSP430F2101 <sup>3</sup>	1K	128	14	—	3	—
MSP430F2111 <sup>3</sup>	2K	128	14	—	3	—
MSP430F2121 <sup>3</sup>	4K	256	14	—	3	—
MSP430F2131 <sup>3</sup>	8K	256	14	—	3	—
(C) ROM (F) Flash	Program	SRAM	I/O	DMA	LCD Seg (8-Bit Basic Timer)	Timer_A 16-Bit No. of C/C <sup>1</sup>
<b>Flash/ROM-Based F4xx Family With LCD Driver2 and 16-Bit Watchdog (V<sub>CC</sub> 1.8–3.6 V)</b>						
MSP430F412	4 KB	256	48	—	96	3
MSP430C412	4 KB	256	48	—	96	3
MSP430F413	8 KB	256	48	—	96	3
MSP430C413	8 KB	256	48	—	96	3
MSP430F415	16 KB	512	48	—	96	3,5
MSP430F417	32 KB	1024	48	—	96	3,5
MSP430FW423	8 KB	256	48	—	96	3,5
MSP430FW425	16 KB	512	48	—	96	3,5
MSP430FW427	32 KB	1024	48	—	96	3,5
MSP430F423	8 KB	256	14	—	128	3
MSP430F425	16 KB	512	14	—	128	3
MSP430F427	32 KB	1024	14	—	128	3
MSP430FE423	8 KB	256	14	—	128	3
MSP430FE425	16 KB	512	14	—	128	3
MSP430FE427	32 KB	1024	14	—	128	3
MSP430F4250 <sup>3,5</sup>	16 KB	256	32	—	56	3
MSP430F4260 <sup>3,5</sup>	24 KB	256	32	—	56	3
MSP430F4270 <sup>3,5</sup>	32 KB	256	32	—	56	3
MSP430F435	16 KB	512	48	—	128/160	3
MSP430F436	24 KB	1024	48	—	128/160	3
MSP430F437	32 KB	1024	48	—	128/160	3
MSP430FG437	32 KB	1024	48	✓	128	3
MSP430FG438	48 KB	2048	48	✓	128	3
MSP430FG439	60 KB	2048	48	✓	128	3
MSP430F447	32 KB	1024	48	—	160	3
MSP430F448	48 KB	2048	48	—	160	3
MSP430F449	60 KB	2048	48	—	160	3

<sup>1</sup>C/C = Capture/Comparisons<sup>2</sup>Suggested 1,000 unit resale price in U.S. dollars.

## MSP430 Microcontrollers: Ultra-Low-Power, 16-Bit RISC



	USART	I <sup>2</sup> C	SVS	Brown-Out Reset	MPY	Comp_A	Temp Sensor	ADC	Additional Analog	Pins/Pkg	Price <sup>2</sup>
—	—	—	—	—	—	✓	—	slope	—	20 DGV, DW, PW, 24 RGE	\$0.99
—	—	—	—	—	—	✓	—	slope	—	20 DW, PW, 24 RGE	\$0.60
—	—	—	—	—	—	✓	—	slope	—	20 DGV, DW, PW, 24 RGE	\$1.35
—	—	—	—	—	—	✓	—	slope	—	20 DW, PW, 24 RGE	\$1.10
—	—	—	—	—	—	✓	—	slope	—	20 DGV, DW, PW, 24 RGE	\$1.70
—	—	—	—	—	—	✓	—	slope	—	20 DW, PW, 24 RGE	\$1.35
—	—	—	✓	—	—	—	✓	5-ch ADC10	—	20 DW, PW, 32 RHB	\$2.00
—	—	—	✓	—	—	—	✓	5-ch ADC10	—	20 DW, PW, 32 RHB	\$2.25
—	—	—	—	—	—	✓	—	slope	—	28 DW, PW, 32 RHB	\$2.15
—	—	—	—	—	—	✓	—	slope	—	28 DW, PW, 32 RHB	\$2.30
1	—	—	✓	—	—	—	✓	8-ch ADC10	—	28 DW, PW, 32 RHB	\$2.40
1	—	—	✓	—	—	—	✓	8-ch ADC10	—	28 DW, PW, 32 RHB	\$2.50
1	—	—	—	—	—	✓	✓	8-ch ADC12	—	64 PM, RTD, PAG	\$3.00
1	—	—	—	—	—	✓	—	slope	—	64 PM, RTD	\$2.00
1	—	—	—	—	—	✓	✓	8-ch ADC12	—	64 PM, RTD, PAG	\$3.60
1	—	—	—	—	—	✓	—	slope	—	64 PM, RTD	\$2.30
2	—	—	—	—	✓	✓	✓	8-ch ADC12	—	64 PM, RTD, PAG	\$5.05
2	—	—	—	—	✓	✓	—	slope	—	64 PM, RTD	\$4.60
2	—	—	—	—	✓	✓	✓	8-ch ADC12	—	64 PM, RTD, PAG	\$5.75
2	—	—	—	—	✓	✓	—	slope	—	64 PM, RTD	\$5.30
2	—	—	—	—	✓	✓	✓	8-ch ADC12	—	64 PM, RTD, PAG	\$6.05
2	—	—	—	—	✓	✓	—	slope	—	64 PM, RTD	\$5.60
1	✓	✓	✓	✓	—	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$4.95
1	✓	✓	✓	✓	—	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$5.55
1	✓	✓	✓	✓	—	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$5.85
2	✓	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$6.75
2	✓	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$7.45
2	✓	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$7.95
2	✓	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$8.25
2	✓	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$8.65
2	✓	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12	64 PM, RTD	\$8.95
UART SPI	I <sup>2</sup> C	IrDA	SVS	Brown-Out Reset	MPY	Comp_A	Temp Sensor	ADC	Additional Analog	Pins/Pkg	Price <sup>2</sup>
—	—	—	x	—	—	✓ <sup>4</sup>	—	slope	—	20 DGV, DW, PW, 24 RGE	\$0.99
—	—	—	x	—	—	✓ <sup>4</sup>	—	slope	—	20 DGV, DW, PW, 24 RGE	\$1.35
—	—	—	x	—	—	✓ <sup>4</sup>	—	slope	—	20 DGV, DW, PW, 24 RGE	\$1.70
—	—	—	x	—	—	✓ <sup>4</sup>	—	slope	—	20 DGV, DW, PW, 24 RGE	\$2.05
Timer B 16-Bit No. of C/C <sup>1</sup>	USART	SVS	Brown-Out Reset	MPY	Comp_A	Temp Sensor	ADC	Additional Analog	Pins/Pkg	Price <sup>2</sup>	
—	—	✓	✓	—	✓	—	slope	—	64 PM, RTD	\$2.60	
—	—	✓	✓	—	✓	—	slope	—	64 PM, RTD	\$1.90	
—	—	✓	✓	—	✓	—	slope	—	64 PM, RTD	\$2.95	
—	—	✓	✓	—	✓	—	slope	—	64 PM, RTD	\$2.10	
—	—	✓	✓	—	✓	—	slope	—	64 PM	\$3.40	
—	—	✓	✓	—	✓	—	slope	—	64 PM	\$3.90	
—	—	✓	✓	✓	✓	✓	slope	Flow-meter	64 PM	\$3.75	
—	—	✓	✓	✓	✓	✓	slope	Flow-meter	64 PM	\$4.05	
—	—	✓	✓	✓	✓	✓	slope	Flow-meter	64 PM	\$4.45	
—	1	✓	✓	✓	✓	✓	✓	(3) SD16	—	64 PM	\$4.50
—	1	✓	✓	✓	✓	✓	✓	(3) SD16	—	64 PM	\$4.95
—	1	✓	✓	✓	✓	✓	✓	(3) SD16	—	64 PM	\$5.40
—	1	✓	✓	✓	✓	✓	✓	(3) SD16	E meter	64 PM	\$4.85
—	1	✓	✓	✓	✓	✓	✓	(3) SD16	E meter	64 PM	\$5.45
—	1	✓	✓	✓	✓	✓	✓	(3) SD16	E meter	64 PM	\$5.95
—	—	✓	✓	—	—	—	SD16	(1) DAC12	48 DL	\$3.95	
—	—	✓	✓	—	—	—	SD16	(1) DAC12	48 DL	\$4.25	
—	—	✓	✓	—	—	—	SD16	(1) DAC12	48 DL	\$4.55	
3	1	✓	✓	✓	✓	✓	✓	8-ch ADC12	—	80 PN, 100 PZ	\$4.40
3	1	✓	✓	✓	✓	✓	✓	8-ch ADC12	—	80 PN, 100 PZ	\$4.65
3	1	✓	✓	✓	✓	✓	✓	8-ch ADC12	—	80 PN, 100 PZ	\$4.85
3	1	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12, (3) OPAMP	80 PN	\$6.50
3	1	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12, (3) OPAMP	80 PN	\$7.35
3	1	✓	✓	✓	✓	✓	✓	8-ch ADC12	(2) DAC12, (3) OPAMP	80 PN	\$7.95
7	2	✓	✓	✓	✓	✓	✓	8-ch ADC12	—	100 PZ	\$5.65
7	2	✓	✓	✓	✓	✓	✓	8-ch ADC12	—	100 PZ	\$6.40
7	2	✓	✓	✓	✓	✓	✓	8-ch ADC12	—	100 PZ	\$6.95

<sup>3</sup>Product Preview<sup>5</sup>Contrast controller with LCD\_A module

All production parts support industrial temperature range.



## Logic Products

### Bus Interface Products

- The LVC and ALVC families offer  $V_{CC}$  fully specified to match the needs of the TMS320™ DSP family: 3.3 V, 2.5 V and 1.8 V
- Broad range of surface mount packaging options from SOIC to BGA
- Propagation delays of 3 ns and below
- Bus hold on data inputs decreases system component count by eliminating the need for external pull-up/pull-down resistors

### Little Logic

- Ability to place a single gate in critical locations provides for simplified routing and board space savings
- Single gates also provide easy state change for control inputs
- The NanoStar™ package provides the industry's smallest logic package

### Level Translation

- Interfacing any low-voltage component with legacy, high-voltage devices
- Protects a DSP that has non-over-voltage tolerant inputs

### Signal Switches

- Provide an optimized interface solution between DSPs and peripheral components
- Offer high-bandwidth (up to 500 MHz), low-power bus interfacing when signal buffering is not required
- Allow bidirectional data flow with near-zero propagation delay
- Support both digital and analog applications: PCI interface, USB interface, hot-card insertion, memory interleaving, bus isolation, level translation, low-distortion signal gating

### I/O Expansion

- I<sup>2</sup>C-to-parallel port expander
- Compatible with most processors and microcontrollers

### Bus Interface for TMS320 DSPs

Device	Description	Supply Voltage	$t_{pd\ max}$ (ns)	Package (Number of Pins)
SN74ALVC16244A	16-bit buffer/driver with 3-state outputs	3.3 V	3	TSSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16244	16-bit buffer/driver with 3-state outputs	3.3 V	3	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16245	16-bit bus transceiver with 3-state outputs	3.3 V	3	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16373	16-bit transparent D-type latch with 3-state outputs	3.3 V	3.6	TSSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16374	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.2	TSSOP, SSOP(48)/VFBGA(56)
SN74ALVC16835	18-bit Universal Bus driver with 3-state outputs	3.3 V	3.6	TSSOP, TVSOP, SSOP, VFBGA(56)
SN74ALVCH16835	18-bit Universal Bus driver with 3-state outputs	3.3 V	3.6	TSSOP, TVSOP, SSOP, VFBGA(56)
SN74ALVCH162244	16-bit buffer/driver with 3-state outputs	3.3 V	4.2	TSSOP, SSOP(48)
SN74ALVCH162374	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.6	TSSOP, SSOP(48)
SN74ALVCH162835	18-bit Universal Bus driver with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(56)
SN74ALVCH162835	18-bit Universal Bus driver with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(56)
SN74LVC16244A	16-bit buffer/driver with 3-state outputs	3.3 V	4.1	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16244A	16-bit buffer/driver with 3-state outputs	3.3 V	4.1	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16245A	16-bit bus transceiver with 3-state outputs	3.3 V	4	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16245A	16-bit bus transceiver with 3-state outputs	3.3 V	4	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16373A	16-bit transparent D-type latch with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16373A	16-bit transparent D-type latch with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16374A	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.5	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16374A	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.5	TSSOP, TVSOP, SSOP(48)/VFBGA(56)

### Little Logic for TMS320 DSPs

Device	Description	Supply Voltage	$t_{pd\ max}$ (ns)	Package (Number of Pins)
SN74LVC1G00	Single 2-input positive-NAND gate	3.3 V	4.7	SOT, DSBGA (5)
SN74LVC1G04	Single inverter	3.3 V	4.2	SOT, DSBGA (5)
SN74LVC1G07	Single buffer/driver with open-drain output	3.3 V	4.2	SOT, DSBGA (5)
SN74LVC1G08	Single 2-input positive-AND gate	3.3 V	4.5	SOT, DSBGA (5)
SN74LVC1G10	Single 3-input positive-NAND gate	3.3 V	3.8	SOT, DSBGA (6)
SN74LVC1G11	Single 3-input positive-AND gate	3.3 V	4.1	SOT, DSBGA (6)
SN74LVC1G14	Single Schmitt-Trigger inverter	3.3 V	5.5	SOT, DSBGA (5)
SN74LVC1G19	1-of-2 decoder/demultiplexer	3.3 V	4	SOT, DSBGA (6)
SN74LVC1G27	Single 3-input positive-NOR gate	3.3 V	4.5	SOT, DSBGA (6)
SN74LVC1G32	Single 2-input positive-OR gate	3.3 V	4.5	SOT, DSBGA (5)
SN74LVC1G57	Configurable multiple-function gate	3.3 V	6.3	SOT, DSBGA (6)
SN74LVC1G58	Configurable multiple-function gate	3.3 V	6.3	SOT, DSBGA (6)
SN74LVC1G79	Single positive-edge-triggered D-type flip-flop	3.3 V	5.2	SOT, DSBGA (5)
SN74LVC1G97	Configurable multiple-function gate	3.3 V	6.3	SOT, DSBGA (6)
SN74LVC1G98	Configurable multiple-function gate	3.3 V	6.3	SOT, DSBGA (6)
SN74LVC1G125	Single bus buffer gate with 3-state outputs	3.3 V	4.5	SOT (5), DSBGA (5)
SN74LVC1G332	Single 3-input positive-OR gate	3.3 V	4.5	SOT, DSBGA (6)
SN74LVC1G386	Single 3-input positive-XOR gate	3.3 V	4.5	SOT, DSBGA (6)
SN74AUC1G00	Single 2-input positive-NAND gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G04	Single inverter gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G07	Single buffer/driver with open-drain output	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G08	Single 2-input positive-AND gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G14	Single Schmitt-Trigger inverter	1.8 V	2.8	SOT, DSBGA (5)
SN74AUC1G32	Single 2-input positive-OR gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G79	Single positive-edge-triggered D-type flip-flop	1.8 V	1.9	SOT, DSBGA (5)
SN74AUC1G125	Single bus buffer gate with 3-state output	1.8 V	2.5	SOT (5), DSBGA (5)
SN74AUP1G08	Low-power single 2-input positive-AND gate	3.3 V	4.2	SOT (5)
SN74AUP1G57	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)
SN74AUP1G58	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)
SN74AUP1G97	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)
SN74AUP1G98	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)



## Level Translation for TMS320 DSPs

Device	Description	Bit Width	V <sub>CCA</sub> (V)	V <sub>CCB</sub> (V)	Package (Number of Pins)
SN74ALVC164245	16-bit 2.5-V to 3.3-V/3.3-V to 5-V level shifting transceiver with 3-state outputs	16	2.3 to 3.6	3 to 5.5	SSOP, TSSOP (48) / VFBGA (56)
SN74AVC8T245	8-bit dual-supply bus transceiver with configurable voltage translation and 3-state outputs	8	1.4 to 3.6	1.4 to 3.6	TSSOP, QFN (24)
SN74AVCA164245	16-bit dual-supply bus transceiver with configurable voltage translation and 3-state outputs	16	1.4 to 3.6	1.4 to 3.6	TSSOP(48) / VFBGA (56)
SN74AVCB164245	32-bit dual-supply bus transceiver with configurable voltage translation and 3-state outputs	32	1.4 to 3.6	1.4 to 3.6	LFBGA (96)
SN74LVC1T45	Single-bit dual-supply bus transceiver with configurable voltage translation and 3-state outputs	1	1.65 to 5.5	1.65 to 5.5	SOT, DSBGA (6)
SN74LVC2T45	Dual-bit dual-supply transceiver with configurable voltage translation and 3-state outputs	2	1.65 to 5.5	1.65 to 5.5	SSOP, VSSOP, DSBGA (8)
SN74LVC4245A	Octal bus transceiver and 3.3-V to 5-V shifter with 3-state outputs	8	4.5 to 5.5	2.7 to 3.3	SSOP, SOIC, TSSOP (24)
SN74LVCC4245A	Octal bus transceiver with adjustable output voltage and 3-state outputs	8	4.5 to 5.5	2.7 to 3.3	SSOP, SOP, SOIC, TSSOP (24)
SN74LVCC3245A	Octal bus transceiver with adjustable output voltage and 3-state outputs	8	2.3 to 3.3	2.7 to 5.5	SSOP, SOP, SOIC, TSSOP (24)

## Signal Switches for TMS320 DSPs

Device	Description	Supply Voltage (V)	t <sub>pd max</sub> (ns)	Package (Number of Pins)
SN74CB3Q3253	High-bandwidth dual 1-of-4 FET multiplexer/demultiplexer	2.3 to 3.6	0.18	SSOP, TVSOP, TSSOP, QFN (16)
SN74CB3Q3257	High-bandwidth 4-bit 1-of-2 FET multiplexer/demultiplexer	2.3 to 3.6	0.2	SSOP, TVSOP, TSSOP, QFN (16)
SN74CB3Q3306A	High-bandwidth dual-FET bus switch	2.3 to 3.6	0.2	VSSOP, TSSOP (8)
SN74CB3Q3125	High-bandwidth quadruple-FET bus switch	2.3 to 3.6	0.2	SSOP (16), TVSOP, TSSOP, QFN (14)
SN74CB3Q3384A	High-bandwidth 10-bit FET bus switch	2.3 to 3.6	0.15	SSOP, TVSOP, TSSOP (24)
SN74CB3T253	Dual 1-of-4 FET multiplexer/demultiplexer with 5-V tolerant level shifter	2.3 to 3.6	0.25	SOIC, SSOP, TVSOP, TSSOP (16)
SN74CB3T257	4-bit 1-of-2 FET multiplexer/demultiplexer with 5-V tolerant level shifter	2.3 to 3.6	0.25	TVSOP, TSSOP (16)
SN74CB3T1G125	Single 1-bit FET bus switch with 5-V tolerant level shifter	2.3 to 3.6	0.25	SOP (5)
SN74CB3T3306	Dual-FET bus switch with 5-V tolerant level shifter	2.3 to 3.6	0.25	SSOP, VSSOP (8)
SN74CB3T3125	Quadruple-FET bus switch with 5-V tolerant level shifter	2.3 to 3.6	0.25	TVSOP, TSSOP (14)
SN74CB3T3384	10-bit FET bus switch with 5-V tolerant level shifter	2.3 to 3.6	0.25	SSOP, SOIC, TSSOP (24)
SN74CBTLV3251	1-of-8 FET multiplexer/demultiplexer	2.3 to 3.6	0.25	SOIC, SSOP, TVSOP, TSSOP, QFN (16)
SN74CBTLV3253	Dual 1-of-4 FET multiplexer/demultiplexer	2.3 to 3.6	0.25	SOIC, SSOP, TVSOP, TSSOP, QFN (16)
SN74CBTLV3257	4-bit 1-of-2 FET multiplexer/demultiplexer	2.3 to 3.6	0.25	SOIC, SSOP, TVSOP, TSSOP, QFN (16)
SN74CBTLV1G125	Single 1-bit FET bus switch	2.3 to 3.6	0.25	SOP (5)
SN74CBTLV3125	Quadruple-FET bus switch	2.3 to 3.6	0.25	SSOP (16), SOIC, SOP, TVSOP, TSSOP, QFN (14)
SN74CBTLV3384	10-bit FET bus switch	2.3 to 3.6	0.25	SOIC, SSOP, TVSOP, TSSOP (24)
SN74LVC1G3157	Single-pole, double-throw (SPDT) analog switch	1.65 to 5.5	0.3	SOP, DSBGA, (6)
SN74AUC2G53	Single pole, double-throw (SPDT) analog switch or 2:1 analog multiplexer/demultiplexer	0.8 to 2.7	0.1	SSOP, VSSOP (8)
SN74AUC2G66	Dual-bilateral analog switch	0.8 to 2.7	0.4	SSOP, VSSOP (8)

## I/O Expansion for TMS320 DSPs

Device	Description	Supply Voltage	t <sub>pd max</sub> (ns)	Package (Number of Pins)
PCF8574	Remote 8-bit I/O expander for I <sup>2</sup> C bus	3.3 V	NA	PDIP, SOIC (16) / TSSOP (20)
PCF8574A	Remote 8-bit I/O expander for I <sup>2</sup> C bus	3.3 V	NA	PDIP, SOIC (16) / TSSOP (20)

**ADCs, DACs, CODECs and Special Functions****Data Converters Plug-In for Texas Instruments Code Composer Studio™ IDE**

Texas Instruments Data Converter Plug-In (DCP) is a free development tool that allows the user of Code Composer Studio™ Integrated Development Environment (IDE) to create initialization data and configuration software for TI data converters.

The DCP provides easy-to-use windows for "point-and-click" configuration of TI data converters from within an IDE, preventing illegal combinations of settings. It also automatically creates the necessary interface software and data structures as C source code and inserts this code into the existing user project. The created files contain the functions necessary to reset and initialize the data converter, read/write sample values and perform special functions such as power-down.

To download your free 3.2 version of the Data Converter Plug-In for Code Composer Studio IDE go to:

[www.ti.com/sc/dcplug-in](http://www.ti.com/sc/dcplug-in)

New plug-ins are added quarterly.

Device	Description	Configuration	C28x™	C54x™	C55x™	C6000™	C64x™
<b>ADCs</b>							
ADS803/4/5	12-bit, 5/10/20 MSPS, 1 channel	X	—	—	—	X	X
ADS1216/17/18	24-bit, 0.78 kSPS, 8 channel	X	—	X	X	X	—
ADS1240/41	24-bit, 15 SPS, 4/8 channel	X	—	X	—	X	—
ADS1251/52	24-bit, 20/40 kSPS, 1 channel	X	—	X	X	X	—
ADS1253/54	24-bit, 20 kSPS, 4 channel, 1.8–3.6V / 5V	X	—	X	—	X	—
ADS1255/56	24-bit, 30 kSPS, low noise	X	—	X	—	X	—
ADS1605	16-bit, 5 MSPS, 1 channel, 3.3-V I/O, 5-V analog	X	—	—	X	X	X
ADS1606	16-bit, 5 MSPS, 1 channel, 16-word FIFO	X	—	—	X	X	X
ADS1625	18-bit, 1.25 MSPS, 1 channel, 3.3-V I/O, 5-V analog	X	—	—	X	X	X
ADS1626	18-bit, 1.255 MSPS, 1 channel, 16-word FIFO	X	—	—	X	X	X
ADS7841/44	12-bit, 200 kSPS, 4/8 channel	X	—	X	—	—	—
ADS7861	12-bit, 500 kSPS, 2+2 channel	X	X	X	X	X	X
ADS7864	16-bit, 500 kSPS, 6 channel	X	X	—	X	X	—
ADS7869	12-bit, 1 MSPS, 12 channel, 7 simultaneous	X	X	X	X	X	X
ADS8320/21	16-bit, 100 kSPS, 1 channel, 2.7–5 V / 5 V	X	—	X	—	—	—
ADS8322/23	16-bit, 500 kSPS, 1 channel	X	—	—	X	X	X
ADS8324	16-bit, 50 kSPS, 1 channel, 2.7–3 V	X	—	X	—	—	—
ADS8361	12-bit, 500 kSPS, 4 channel	X	X	X	X	X	X
ADS8364	16-bit, 250 kHz, 6 channel	X	—	X	—	X	—
ADS8381	18-bit, 580 kSPS, 1 channel	X	—	—	X	X	X
ADS8383	18-bit, 500 kSPS, 1 channel	X	—	—	X	X	X
ADS8401/2	16-bit, 1.25 MSPS, 1 channel uni-/bi-polar	X	—	—	X	X	X
ADS8411/12	16-bit, 2 MSPS, 1 channel uni-/bi-polar	X	—	—	X	X	X
THS1007/09	10-bit, 8 MSPS, 4/2 channel	X	X	X	X	X	X
THS10064/82	10-bit, 8 MSPS, 4/2 channel, 16-word FIFO	X	X	X	X	X	X
THS1206	12-bit, 6 MSPS, 4 channel, 16-word FIFO	X	X	X	X	X	X
THS1207	12-bit, 8 MSPS, 4 channel	X	X	X	X	X	X
THS1209	12-bit, 8 MSPS, 2 channel	X	X	X	X	X	X
THS12082	12-bit, 8 MSPS, 2 channel, 16-word FIFO	X	X	X	X	X	X
THS1401/03/08	14-bit, 1/3/8 MSPS, 1 channel	X	—	—	—	X	—
THS14F01/03	14-bit, 1/3 MSPS, 1 channel, 32-word FIFO	X	—	—	—	X	—
TLC1514/18	10-bit, 400 kSPS, 4/8 channel	X	—	X	—	X	—
TLC2551	12-bit, 400 kSPS, 1 channel, 5 V	X	—	X	—	—	—
TLC2552/55	12-bit, 175 kSPS, 2/1 channel, 5 V	X	—	X	—	—	—
TLC2554/58	12-bit, 400 kSPS, 4/8 channel	X	—	X	—	—	—
TLC2574/78	12-bit, 200 kSPS, 4/8 channel, 5 V	X	—	X	—	—	—
TLC3541	14-bit, 200 kSPS, 1 channel, 5 V	X	—	X	—	X	—
TLC3544/48	14-bit, 200 kSPS, 4/8 channel, 5 V	X	—	X	—	—	—
TLC3545	14-bit, 200 kSPS, 1 channel, 5 V	X	—	X	—	X	—
TLC3574/78	14-bit, 200 kSPS, 4/8 channel, 5 V	X	—	X	—	—	—
TLC4541/45	16-bit, 200 kSPS, 1 channel, 5 V	X	—	X	—	X	—
TLV1504/08	10-bit, 200 kSPS, 4/8 channel	X	—	X	—	X	—
TLV1570	10-bit, 1.25 MSPS, 8 channel	X	—	X	—	—	—
TLV1571/78	10-bit, 1.25 MSPS, 1/8 channel	X	—	X	—	X	—
TLV1572	10-bit, 1.25 MSPS, 1 channel, S and H	X	—	X	—	—	—
TLV2541	12-bit, 200 kSPS, 1 channel, 2.7–5.5 V	X	—	X	—	—	—
TLV2542/45	12-bit, 140–200 kSPS, 2/1 channel, 2.7–5.5 V	X	—	X	—	—	—
TLV2544/48	12-bit, 200 kSPS, 4/8 channel	X	—	X	—	X	—
TLV2553/56	12-bit, 200 kSPS, 11 channel, int. reference	X	X	X	X	X	X

**ADCs, DACs, CODECs and Special Functions**


Device	Description	Configuration	C28x™	C54x™	C55x™	C6000™	C64x™
<b>DACs</b>							
DAC1220/21	16-bit, 1 channel, 2 ms	X	X	X	X	X	X
DAC7512/13	12-bit, 1 channel, 2.7–5.5 V, int./ext. reference	X	—	—	—	—	—
DAC8501	16-bit, 1 channel, 2.7–5.5 V, 10 µs, MDAC	X	X	X	X	X	X
DAC8531	16-bit, 1 channel, 2.7–5.5 V, 10 µs	X	X	X	X	X	X
DAC8532/34	16-bit, 2/4 channel, 2.7–5.5 V, 10 µs	X	X	X	X	X	X
PCM4104	24-bit, 200 kSPS, 4 channel, 118 dB stereo DAC	X	—	—	—	X	—
TLC5618A	12-bit, 2 channel, 5 V	X	—	X	—	X(1)	—
TLV5604/14	12/10-bit, 3 µs, 4 channel, 2.7–5.5 V	X	—	—	—	—	—
TLV5606/16	10/12-bit, 1 channel, 2.7–5.5 V	X	—	X	—	X(1)	—
TLV5608	10-bit, 1 µs, 8 channel, 2.7–5.5 V	X	—	—	—	—	—
TLV5610	12-bit, 1 µs, 8 channel, 2.7–5.5 V	X	—	—	—	—	—
TLV5617A/18A	10/12-bit, 2 channel, 2.7–5.5 V	X	—	X	—	X(1)	—
TLV5623/25	8-bit, 1/2 channel, 2.7–5.5 V	X	—	X	—	X(1)	—
TLV5624/26	8-bit, 1/2 channel, 2.7–5.5 V, int. reference	X	—	X	—	X(1)	—
TLV5629	8-bit, 1 µs, 8 channel, 2.7–5.5 V	X	—	—	—	—	—
TLV5630/31/32	12/10/8-bit, 1 µs, 8 channel, 2.7–5.5 V	X	—	—	—	—	—
TLV5636/38	12-bit, 1/2 channel, 2.7–5.5 V, int. reference	X	—	X	—	X(1)	—
TLV5637	10-bit, 2 channel, 2.7–5.5 V, int. reference	X	—	X	—	X(1)	—
<b>CODECs</b>							
AIC111	16-bit, 40 kSPS, 1 channel, 1.3 V	X	—	X	—	—	—
TLV320AIC10	16-bit, 22 kSPS	X	—	X	—	—	X
TLV320AIC11	16-bit, 22 kSPS, 1.1–3.6 V I/O	X	—	X	—	—	X
TLV320AIC12	16-bit, 26 kSPS, 1 channel	X	—	X	X	X	X
TLV320AIC13	16-bit, 26 kSPS, 1 channel, 1.1-V I/O	X	—	X	X	X	X
TLV320AIC14	16-bit, 26 kSPS, 1 channel	X	—	X	X	X	X
TLV320AIC15	16-bit, 26 kSPS, 1 channel, 1.1-V I/O	X	—	X	X	X	X
TLV320AIC20	16-bit, 26 kSPS, 2 channel, 3.3-V I/O	X	—	X	X	X	X
TLV320AIC21	16-bit, 26 kSPS, 1 channel, 1.1-V I/O	X	—	X	X	X	X
TLV320AIC22C	Dual-VoIP CODEC	X	—	X	X	X	X
TLV320AIC23	24-Bit, 96 kHz, stereo	X	—	X	—	—	—
TLV320DAC23	16/20/24/32-bit, 96 kSPS, stereo DAC	X	—	—	—	—	—
TLC320AIC24	16-bit, 26 kSPS, 1 channel, 3.3-V I/O	X	—	X	X	X	X
TLC320AIC25	16-bit, 26 kSPS, 1 channel, 1.1-V I/O	X	—	X	X	X	X
TLV320AIC26	16-bit, 48 kSPS, low power, headphone amp	X	—	—	—	—	—
TLV320AIC28	16-bit, 48 kSPS, low power, headphone and speaker amp	X	—	—	—	—	—
PCM1804	24-bit, 192 kSPS, stereo	X	—	X	X	X	X
PCM3002	16/20-bit, 48 kSPS, stereo	X	—	X	—	X	—
PCM4202	24-bit, 192 kSPS, stereo	X	—	—	X	X	X
<b>Special Functions</b>							
AFE1230	G.SHDSL analog front end	X	—	X	X	—	—
AMC7820	Analog monitoring and control circuitry	X	—	X	—	X	X



## eXpressDSP™ Software and Development Tools

### eXpressDSP Software and Development Tools

Complete, Open, Real-Time Software Environment for TI DSPs

Get more information about eXpressDSP Software and Development Tools at: [www.ti.com/software](http://www.ti.com/software)

#### Standardization and Software Reuse Move DSP Development to a New Level

- Standards enabled for modular, reusable multi-function applications
- Developers of all experience levels
- Integrate your own software
- Catalog of interoperable software
- Focus on adding value/differentiation
- Designed to cut development time by up to 50 percent and increase the modularity

#### Tools and Standards to Simplify Application Development, Reduce System Cost, Enhance Product Robustness and Innovation and Accelerate Time-to-Market

- Powerful, integrated development environment (Code Composer Studio™ Development Tools)
- Scalable real-time kernel (DSP/BIOS™ Kernel)
- eXpressDSP-compliant algorithms (written to the TMS320™ DSP Algorithm Standard)
- Reusable modular software and support from TI's DSP Third Party Network
- Available on TMS320C6000™, TMS320C5000™ and TMS320C2000™ DSP platforms
- Advanced data visualization and real-time analysis
- Powerful code generation tools
- Open plug-in architecture



#### What are eXpressDSP Software and Development Tools?

TI's real-time eXpressDSP Software and Development Tools provide a complete and open DSP software environment to simplify and streamline the DSP product development process. It provides access to a large number of reusable software components, host tooling (Code

Composer Studio™ Development Tools) and target-side content (eXpressDSP-compliant algorithms and DSP/BIOS™ kernel) to reduce development time. For information on eXpressDSP Software and Development Tools, visit [www.ti.com/software](http://www.ti.com/software)

#### Code Composer Studio Development Tools

- Comprehensive IDE includes tools for editing, debugging, compiling, code profiling and more
- Free evaluation tools available
- Sophisticated project manager enables team-based development
- Fast simulators provide deeper visibility for quick and precise problem resolution
- Analysis Tool Kit boosts performance and simplifies tedious guess work with new utilities
- Enhanced Pipeline Analysis tool provides detailed pipeline visibility

#### XDS560™ Emulator

- PCI-based emulator supporting high-speed RTDX™-enabled devices
- Speeds time-to-market with real-time data transfer rates of over 2 MBytes/second
- Increases productivity with faster start up for larger applications
- Quickly finds and fixes intermittent real-time problems
- Upward compatible with XDS510™ Emulators

#### eXpressDSP Software

##### eXpressDSP Reference Frameworks

- Get started today – out-of-the-box framework software
- Adaptable to your needs – 100 percent C-source code
- Pick version just right for you – available for different applications
- Reduces cost – royalty-free run-time licensing (RF1, RF3, RF5 and RF6)
- Saves time – eliminates design, build and test of low-level parts of DSP solution

##### eXpressDSP DSP/BIOS Kernel

- No run-time royalty – free with Code Composer Studio Development Tools
- Integrated with Code Composer Studio Development Tools
- Includes preemptive multitasking scheduler and real-time analysis

##### eXpressDSP-Compliant Algorithms

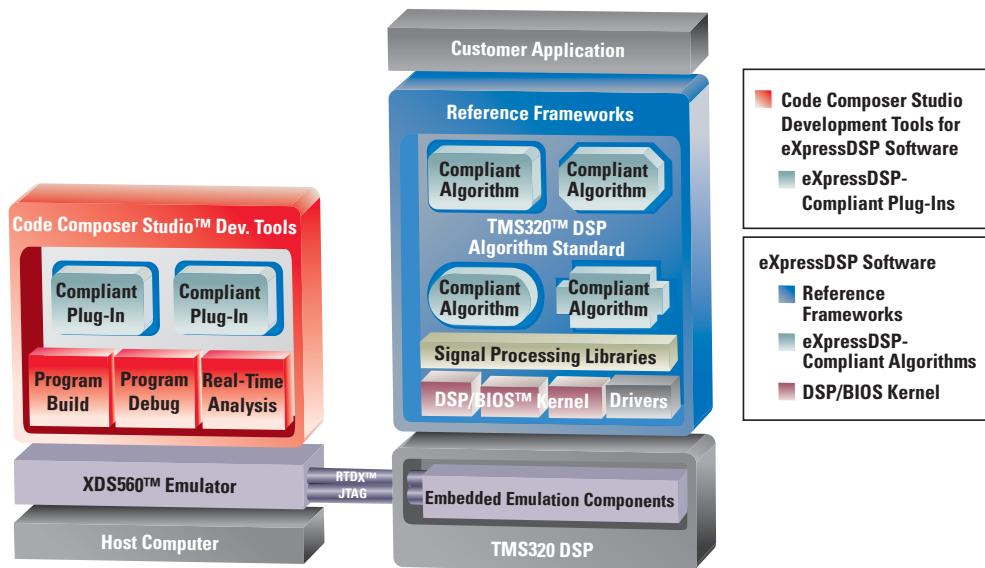
- Available for a myriad of applications
- Written to the TMS320™ DSP Algorithm Standard

#### TI DSP Third Party Network

- Get started now and focus on differentiating your product. Over 700 third parties offer hundreds of compliant algorithms, hardware boards, emulators and more

- More than 700 eXpressDSP-compliant algorithms and plug-ins available today

## eXpressDSP™ Reference Frameworks

**eXpressDSP Software and Development Tools Block Diagram**

eXpressDSP Software Development Tools for faster programming and easier integration.

**eXpressDSP Reference Frameworks***Getting Started Software for DSP-Based Application Development Increases Productivity and Speeds Time-to-Market with Differentiated Products*

Accelerating the software development process for designers of DSP-based applications, TI produces and supports a series of DSP software Reference Frameworks (RF). The design-ready RFs are getting-started solutions for

designers in the early stages of application development, featuring easy-to-use source code that is common to many applications. With TI's RFs, much of the initial low-level design decisions have been eliminated allowing developers more time to focus on the code that truly differentiates products. Designers can choose the specific RF that best meets their system needs and then populate the

RF with algorithms from either the 650+ eXpressDSP-compliant algorithms or their own algorithms, creating specific applications for a range of end-equipments such as broadband, voice, video imaging, biometrics and wireless infrastructure.

For more information, visit  
[www.ti.com/rfinfo](http://www.ti.com/rfinfo)

Design Parameter	Compact	Flexible	Extensive	Connected
Absolute minimum footprint	Yes	–	–	–
Static configuration	Yes	Yes	Yes	Yes
Static memory management	Yes	Yes	Yes	Yes
Single-rate operation	Yes	Yes	Yes	Yes
Number of channels	1 to 3	1 to 10+	1 to 100+	1 to 100+
Number of eXpressDSP algorithms	1 to 3	1 to 10+	1 to 100+	1 to 100+
Dynamic memory allocation	–	Yes	Yes	Yes
Multi-rate operation	–	Yes	Yes	Yes
Implements control functionality	–	Yes	Yes	Yes
Thread preemption	–	Yes	Yes	Yes
Thread suspension (semaphores)	–	–	Yes	Yes
Dynamic object creation	–	–	Yes	Yes
Implements DSP-GPP functionality	–	–	–	Yes
Memory footprint (less algorithms)	C54x™ C55x™ C64x™	3.5 kw 5 kw –	11 kw 12 kw –	– 17 kw 54 kB
Name of Reference Framework	RF1	RF3	RF5	RF6
Availability	Now	Now	Now	Now

## Code Composer Studio™ Development Tools for eXpressDSP™ Software

### Code Composer Studio Software Development Tools

#### Integrated Development Environment

Get more information about Code Composer Studio Development Tools at: [www.ti.com/ccstudio](http://www.ti.com/ccstudio)

#### Code Composer Studio Development Tools Simplify DSP Development

Code Composer Studio software is a fully integrated development environment (IDE) supporting Texas Instruments industry-leading TMS320C6000™, TMS320C5000™ and TMS320C2000™ DSP platforms. Code Composer Studio IDE is a key component of eXpressDSP Software and Development Tools that slashes development and integration time for DSP software.

#### Features and Benefits

- All tools integrated into a single easy-to-use application
- Real-time analysis tools for monitoring program interactions without halting the processor
- Leading C compiler in the industry
- A scalable real-time kernel (DSP/BIOS™ kernel)
- Profile-Based Compiler (C6000™ DSP) for optimizing code size and performance
- Data visualization for viewing signals in multiple graphical formats
- Open plug-in architecture allows you to integrate specialized third-party tools
- Real-time bi-directional application data visibility through RTDX™ technology
- Real-time JTAG scan-based emulation for TI DSPs with the XDS560™ and XDS510™ Emulators
- Easily manage large multi-user, multi-site and multi-processor projects
- Fast simulators provide deeper visibility for quick and precise problem resolution
- Analysis tool kit boosts performance and simplifies tedious guess work with new utilities
- Enhanced pipeline analysis tool provides detailed pipeline visibility
- Support for TI's high-performance TMS320C64x™ and low-power TMS320C55x™ DSPs

### Code Composer Studio Development Tools Overview

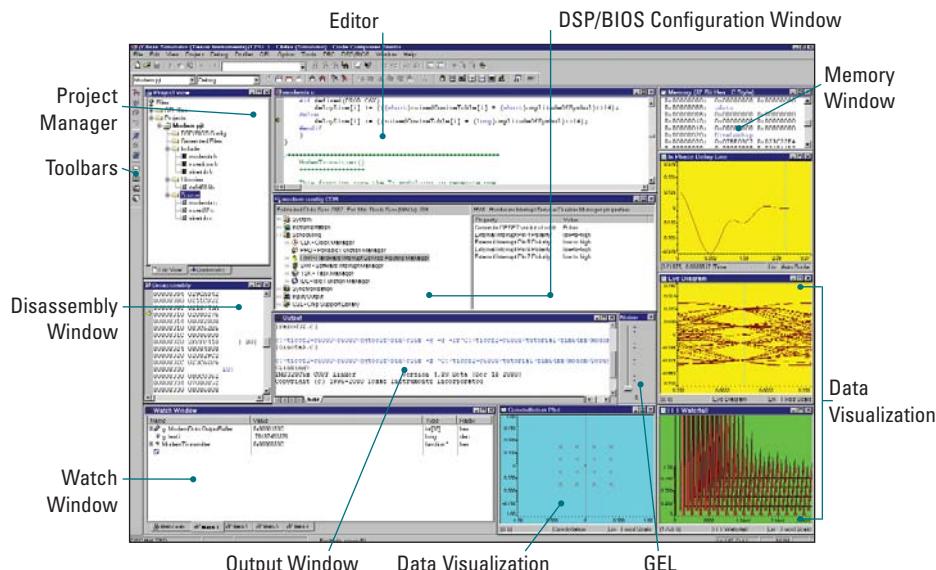
Code Composer Studio IDE includes the features necessary to take you through each step of the application development flow. All of the features are provided in an integrated product allowing developers to focus their energy on innovation. Code Composer Studio IDE has an open architecture that allows TI and third parties to extend the IDE's functionality by seamlessly plugging in additional specialized tools. Such familiar tools and interfaces allow users to get started faster than ever before and add functionality to their application thanks to sophisticated productivity tools.

Code Composer Studio full-function evaluation tools are available for a free 90-day evaluation. To order your CD-ROM, visit [www.ti.com/freetools](http://www.ti.com/freetools)

#### Industry-Leading C/C++ Compiler

Unlike other compilers that rely on public domain (GNU) technology, TI's Code Composer Studio compiler takes advantage of limited registers and makes tight DSP-specific loops. With more than 10 years experience and several patents, the robust and reliable compiler and optimizer technologies allow developers to spend less time hand-coding and more time concentrating on delivering new applications.

Code Composer Studio tools include the only compiler that optimizes code at the program level, which is often critical to performance. The compiler also contains many DSP-specific optimizations, such as software pipelining, conversion/predicate execution, memory address cloning and memory address dependence elimination.



Code Composer Studio Development Tools feature all tools used in the development cycle working tightly together. Edit, build, debug and visualize.

## Code Composer Studio™ Development Tools for eXpressDSP™ Software

**Tuning Tools**

Advanced tools designed specifically for the optimization process are used to improve execution time, utilize cache more efficiently and decrease memory usage. These tools are wrapped with an interactive advisor that walks the user through the tuning process specific to the goals set by the developer.

**Debug Within the IDE**

Code Composer Studio IDE's integrated debugger has DSP-specific capabilities and advanced breakpoints to simplify development. Conditional or hardware breakpoints are based on full C expressions, local variables or CPU register symbols. A General Extension Language (GEL) script file can be executed when a particular breakpoint hits. Global breakpoints are also available for multiprocessor systems. Developers can debug code quickly by selectively stepping into, over, or out of C functions or assembly

subroutines. A ProbePoint™, unique to Code Composer Studio Development Tools, is a sophisticated form of a breakpoint. It allows developers to define a point in the algorithm where oscilloscope-type functions can be performed. Unlike a breakpoint, program execution resumes after hitting a ProbePoint and performs the connected activity (e.g., inject or extract signal data, observe signals, execute GEL script).

**Multi-Target Debug**

Code Composer Studio IDE supports the development of complex systems with multiple boards or multiple processors on a single target board. Code Composer Studio's Parallel Debug Manager (PDM) provides synchronized control over multiple processors configured in single or multiple scan chains. It can be used to launch individual parent windows to control each processor. The Parallel Debug Manager can be used to broadcast

commands to different groups of CPUs in the JTAG scan path. A global breakpoint command on one processor can halt other processors when this breakpoint is encountered. The Parallel Debug Manager lets developers open up separate debug windows for any CPU on any board in the system.

**Real-Time Data Exchange (RTDX™)**

Once algorithms are integrated into applications, the real-time behavior of the system must be observed. Code Composer Studio Development Tools allow the developer to visualize or debug an application while it runs in real time. Real-Time Data Exchange provides significant benefits over alternative methods of system debugging.

RTDX gives developers the industry's first DSP system that provides real-time, continuous visibility into the way target applications operate in the real world.

## Code Composer Studio Development Tools Features Supported by Platform

Feature	C6000™ CCStudio	C5000™ CCStudio	C2000™ CCStudio	OMAP™ CCStudio							
	C62x™	C64x™	C67x™	C54x™	C55x™	C24x™	C28x™	C54x™	C55x™	ARM7	ARM9
IDE	X	X	X	X	X	X	X	X	X	X	X
C/C++ and Assembly	X	X	X	X	X	X*	X	X	X	X	X
DSP/BIOS™ Kernel	X	X	X	X	X		X	X	X		
TMS320™ DSP Algo. Std.	X	X	X	X	X	X	X	X	X		
Reference Frameworks <sup>†</sup>	X	X	X	X	X			X	X		
RTDX™	X	X	X	X	X	X	X	X	X	X	X
Fast Simulation	X	X	X		X				X		
Simulators	X	X	X	X	X	X	X	X	X	X	X
Update Advisor	X	X	X	X	X	X	X	X	X	X	X
Chip Support Libraries	X	X	X	X	X			X	X		
Parallel Debug Manager	X	X	X	X	X	X°	X°	X	X	X	X
Pipeline Analysis					X				X		
Tuning Dashboard	X	X	X								
Compiler Consultant	X	X	X								
CodeSize Tune <sup>†</sup>	X	X	X								
CacheTune	X	X	X								
Connect/Disconnect	X	X	X								
Scripting <sup>†</sup>	X	X	X	X	X			X	X	X	X
Flashburn <sup>†</sup>	X	X	X	X	X			X	X	X	X
Data Converter <sup>†</sup>	X	X	X	X	X	X	X	X	X		
Driver Development Kit <sup>†</sup>	X	X	X	X	X	X	X	X	X		
Analysis Tool Kit <sup>†</sup>	X	X	X		X				X		

\* The C24x only supports C, not C++

° Supports only homogeneous multi-processing

† Formerly called Profile-Based Compiler

† Available through Update Advisor for users with active CCStudio IDE subscription



## Code Composer Studio™ Development Tools for eXpressDSP™ Software

RTDX™ allows developers to transfer data between the host computer and DSP devices without stopping their target application. This shortens development time by giving developers a much more realistic representation of the way their systems operate. RTDX allows designers to continually monitor their systems and gain real-time insight into their running applications.

### Interactive Profiling

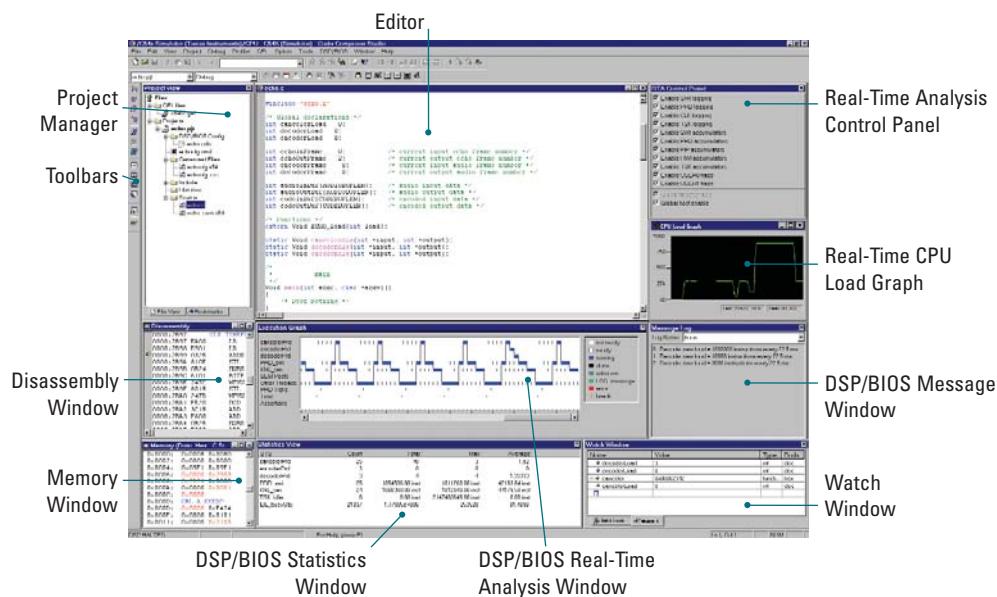
Code Composer Studio IDE's interactive profiler makes it easy to quickly measure code performance and ensure the efficient use of the DSP target's resources during debug and development sessions. The profiler allows developers to easily

profile all C/C++ functions in their application for instruction cycles or other events such as cache misses/hits, pipeline stalls and branches. Profile ranges can be used to concentrate efforts on high-usage areas of code during optimization, helping developers produce finely-tuned code. Profiling is available for ranges of Assembly, C++ or C code in any combination. To increase productivity, all profiling facilities are available throughout the development cycle.

### Real-Time Analysis

Using the real-time analysis capabilities of Code Composer Studio Development Tools, a developer can probe, trace and monitor a DSP application while it runs.

These utilities are based on a real-time link and awareness between the Code Composer Studio Development Tools host environment and the target. Even after the program has been halted, information already captured through the real-time analysis tools can provide invaluable insight into the sequence of events that led up to the current point of execution. Real-time analysis tools are used later in the development cycle when transitioning from the debug phase to the runtime phase. They show subtle problems arising from time-dependent interaction of program components. Real-time analysis tools are the software counterpart of the hardware logic analyzer.



*DSP/BIOS™ configuration and real-time analysis tools are included and are fully integrated with Code Composer Studio IDE.*

Code Composer Studio full-function evaluation tools are available for a free 90-day evaluation. To order your CD-ROM, visit  
[www.ti.com/freetools](http://www.ti.com/freetools)

## DSP/BIOS™ Kernel for eXpressDSP™ Software



## DSP/BIOS Kernel

## Scalable Real-Time Kernel

Get more information about DSP/BIOS Real-Time Kernel at: [www.ti.com/dspbios](http://www.ti.com/dspbios)

## DSP/BIOS Kernel Shortens

## Development Time

DSP/BIOS kernel is a scalable real-time kernel, designed for the TMS320C28x™ DSP generation, TMS320C5000™ and TMS320C6000™ DSP platforms with preemptive multithreading, hardware abstraction, real-time analysis and system configuration tools.

## Features and Benefits

- Quickly design multifunction applications
- Understand your application's real-time behavior
- No need to develop scheduling software
- Simpler device configuration and programming
- Port applications quickly to new devices
- Preemptive multitasking scheduler
- Multiple scheduling and communication mechanisms
- Fast, deterministic performance
- Very small memory footprint
- Configurable functionality
- Graphical configuration
- Static and dynamic task creation
- Integrated real-time analysis tools
  - CPU load
  - Max/Average execution times
  - Task execution trace
  - Kernel object browser

## DSP/BIOS Kernel Overview

DSP/BIOS kernel simplifies the development of today's multifunction DSP applications. Complex applications that are easily organized into separate threads are scheduled in real-time according to their priority. New functionality can be easily added without affecting the response time of critical real-time functions. DSP/BIOS kernel also provides a set of interthread communication mechanisms that enable synchronization between threads if desired.

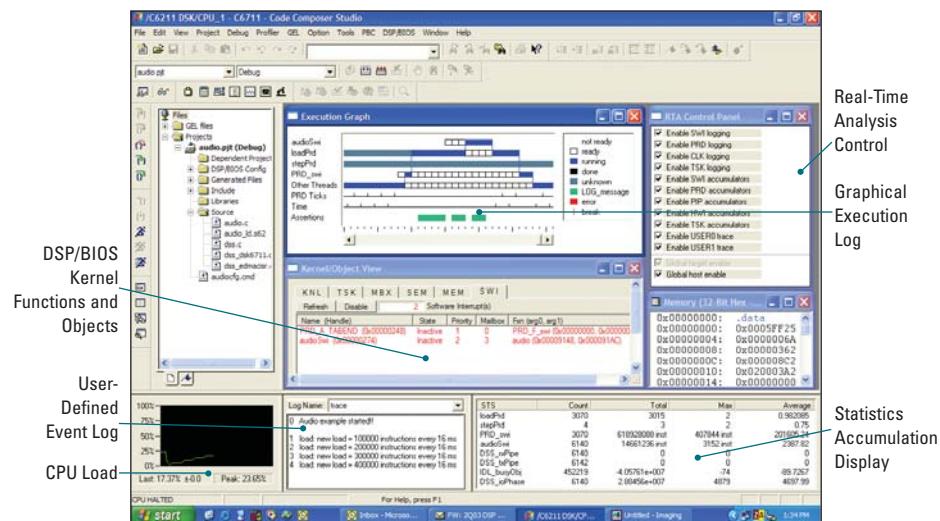
To aid debugging of complex applications, DSP/BIOS kernel includes host-to-target communication and real-time instrumentation services that are integrated with graphical real-time analysis displays on the development host. DSP programmers can instrument their applications to be probed, traced and

monitored as they execute in real-time. Alternatively, programs that take advantage of the multithreading capabilities of the DSP/BIOS kernel are implicitly instrumented; i.e., programs without any explicit calls to the DSP/BIOS kernel APIs can be traced in real-time.

DSP/BIOS kernel is integrated within the Code Composer Studio™ Development Tools, requires no run-time license fees and is fully supported by Texas Instruments.

DSP/BIOS kernel gives you a solid foundation to support substantial, sophisticated programs with a robust, industry-proven software kernel that has been used in thousands of designs.

For more information, visit  
[www.ti.com/dspbios](http://www.ti.com/dspbios)



Find and fix real-time problems without any runtime license fees.



## TMS320™ DSP Algorithm Standard for eXpressDSP™ Software

### TMS320 DSP Algorithm Standard

Standards for Application Interoperability

Get more information on the TMS320 DSP Algorithm Standard at: [www.ti.com/algostanddevkit](http://www.ti.com/algostanddevkit)

#### Features and Benefits

- Allows mixing of interoperable components
- Lowers support and development costs by eliminating custom coding
- Reduces system integration time
- Enables creativity and innovation
- Choose from hundreds of compliant algorithms available today
- Rules for TMS320C2000™, TMS320C5000™ and TMS320C6000™ DSP platforms
- Tools included to help create compliant algorithms, test for compliant algorithms and optimize algorithms for compact systems

#### Mandatory Rules

- The standard consists of the following:
  - 46 basic “common sense” rules for all algorithms
  - IALG APIs – Abstracts DSP memory management away from algorithms
  - IDMA2 APIs – Abstracts DSP DMA management away from algorithms
  - Instruction Set Architecture (ISA) rules for DSPs
  - Naming conventions to reduce name space pollution

#### Optional Guidelines

- Several guidelines to help system integrators
- Methods for extending baseline APIs for added functionality – allowing for differentiation

#### eXpressDSP™ Compliance

- Hundreds of algorithms tested to comply to the TMS320 DSP Algorithm Standard

### TMS320 DSP Algorithm Standard Overview

The standard is a set of coding conventions for algorithm writers that reduces time-consuming system integration for anyone trying to put algorithms into their system. This is achieved by defining common programming rules and guidelines with a set of programming interfaces that are consistently used by algorithms across a wide variety of applications.

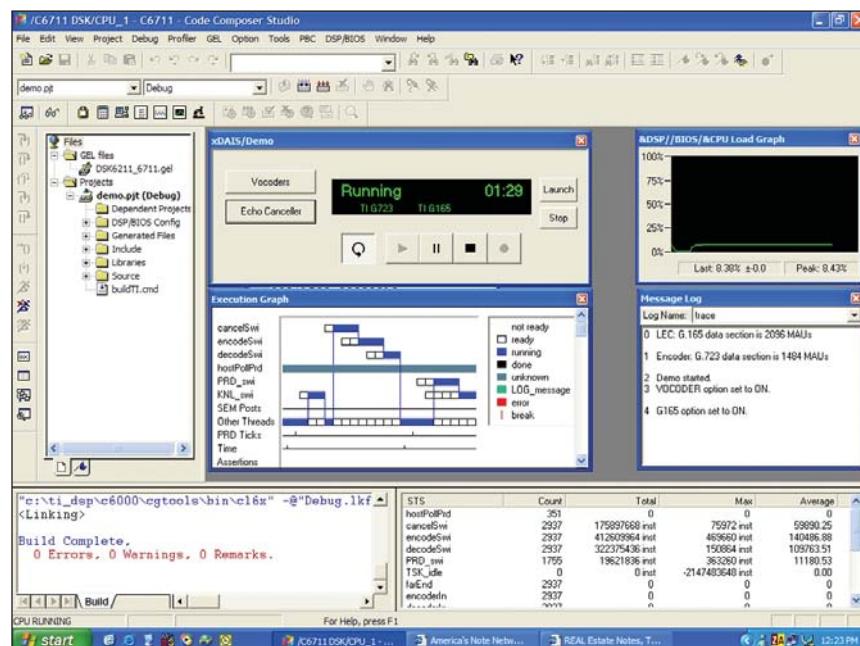
#### TMS320 DSP Algorithm Standard Developer's Kit

The TMS320 DSP Algorithm Standard Developer's Kit provides all the necessary information to enable application developers and system integrators to understand and utilize algorithms compliant to the standard. Information and tools are also provided for new algorithms that are compliant to the standard.

The TMS320 DSP Algorithm Standard Developer's Kit has everything needed to get started.

- TMS320 DSP Algorithm Standard Specification
- Application notes for both producers and users of algorithms
- Example code that builds on evaluation modules (EVMs) and DSP starter kits (DSKs)
- Tools to help with creation of standard header files
- Demo that illustrates the simplicity of algorithm integration
- Support for C6000™, C5000™ and C2000™ DSP platforms

For more information about the TMS320 DSP Algorithm Standard Developer's Kit, visit [www.ti.com/algostanddevkit](http://www.ti.com/algostanddevkit)



The TMS320 DSP Algorithm Standard Developer's Kit demo shows how easily eXpressDSP-compliant algorithms interoperate.

**JTAG Emulator with High-Speed Real-Time Data Link****XDS560™ PCI-Bus Emulator**

PCI-Based Emulator Supporting RTDX™ Data Link

Get more information about the XDS560 Emulator at: [www.ti.com/emulator](http://www.ti.com/emulator)**Features and Benefits**

- **Speed time-to-market with real-time visibility** – High-speed RTDX with real-time data transfer rates of more than 2 MBytes/second
- **Increase productivity through faster start up for larger applications** – Code download speeds of up to more than half a MByte/second
- **Quickly find and fix intermittent real-time problems** – Real-time, non-intrusive breakpoint and action point capabilities via Advanced Event Triggering
- **Preserve existing emulation investment** – Upward compatible with XDS510™ Emulators

**JTAG Emulator with High-Speed Real-Time Data Exchange (RTDX): XDS560 PCI-Bus Emulator**

The XDS560 PCI-Bus Emulator provides an unparalleled level of real-time visibility into executing applications to assist developers in debugging and monitoring real-time systems. High-speed RTDX bandwidth enables visibility into a new range of high-bandwidth applications, as well as multi-channel or multiprocessing versions of lower-bandwidth applications. The XDS560 Emulator can achieve code download speeds of up to more than half a megabyte per second (500 KBytes per second), as much as 8 times faster than XDS510™-class technology, for better loading times of larger applications, speeding development. The XDS560 Emulator also enables Advanced Event Triggering to define and evaluate complex sequences of events before halting the CPU, or taking another action, including:

- Setting hardware breakpoints and watchpoints,
- Counting many kinds of events, and
- Detecting very precise debugging sequences.

The XDS560 Emulator is fully upward compatible with TI's existing XDS510 Emulator. XDS510-class Emulator customers can move from the XDS510 Emulator to using the XDS560 Emulator with very little apparent change, using the same target boards with the existing 14-pin JTAG connectors. The XDS560 Emulator features are a superset of the XDS510 Emulator, but include all of the same XDS510-class functions that TI developers expect, with significantly improved performance.

The XDS560 Emulator's PCI bus is a widely available, high-performance interface with the bandwidth to support high-speed RTDX data rates. It includes a longer and highly flexible 5-1/2 foot (1.5+ m) host-target cable suitable for use from 5 V down to 0.5 V to support TI's low-voltage device roadmap. The



*XDS560 Emulator with highly flexible cable and credit card-sized pod is available in the eStore.*

XDS560 Emulator is based on TI's TMS320C6202 DSP, for additional processing power to help drive the improved performance. It is well suited for space-constrained environments, as the cable can reach into tight places between rack-mounted target boards, and the cable/pod assembly is so light it can even hang from the 14-pin JTAG connector without straining it.

For more information on the XDS560 Emulator, visit [www.ti.com/emulator](http://www.ti.com/emulator)

XDS560-class JTAG Emulator products are also available from many TI third parties featuring different communication interfaces such as Ethernet and USB, as well as other features. See the TI DSP Village Third Party on-line catalog and search for "XDS560."

# DSP Development Tools Feature Matrix



TI Part Number	Tool Description	Annual Subscription										Price \$US*
		Code Composer Studio IDE	DSP/BIOS™ Real-Time Operating System/Kernel Services	TMS320™ DSP Algorithm Standard	Code Generation Tools C/C++	Compiler/Assembler/Linker	XDS510™ Device Drivers	XDS560™ Device Drivers (Emulation software)	RTDX™	Simulator	Target Board (Hardware)	
TMDSCCS6000-1	C6000™ DSP Code Composer Studio™ Development Tools	X	X	X	X	X	X	X	X	X	X	3,595
TMDSSUB6000	Annual Subscription for C6000 DSP Code Composer Studio	X	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	600
TMDSDSK6713	C6713 DSP Starter Kit (DSK)	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	395
TMDXDSK6416-T	C6416 DSP Starter Kit (DSK)	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	495
TMDSEVM642	TMS320D™M642 Evaluation Module											1,995
TMDSDMK642	TMS320D™M642 Digital Media Development Kit											6,495
TMDXNVK6415-T	C64x™ DSP Network Video Developer's Kit											4,495
TMDXVIS642	Video Security over Internet Protocol (VSIPI) Development Platform	X	X	X	X	X	X	X	X	X	X	15,000
TMDXVIS642-3	VSIPI Development Platform with ATEME Emulator	X	X	X	X	X	X	X	X	X	X	16,000
TMDSDVDP4X-2	Videophone Development Kit (VDP)											6,950
TMDSFDFCPC10	Fingerprint Authentication Development Tool											245
TMDSCCS5000-1	C5000™ DSP Code Composer Studio Development Tools	X	X	X	X	X	X	X	X	X	X	3,595
TMDSSUB5000	Annual Subscription for C5000 DSP Code Composer Studio	X	L	L	X	L	L	L	L	L	L	600
SPRC119B	Essential Guide to Getting Started with DSP CD-ROM <sup>†</sup>											Free
SPRC049	Code Composer Studio 90-Day Free Evaluation Tools for OMAP CD-ROM	X	L	L	X	L	L	L	L	L	L	5,400
TMDSCCSOMAP-1	Code Composer Studio for OMAP™ Platform	X	X	X	X	X	X	X	X	X	X	900
TMDSSUBOMAP	Annual Subscription for OMAP Platform Code Composer Studio	X	X	X	X	X	X	X	X	X	X	1,495
TMDSHFSK5407	Hands-Free Kit (HFK) Development Platform											395
TMDSDSK5416	C54x™ DSP Starter Kit (DSK)	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	395
TMDSDSK5510	C55x™ DSP Starter Kit (DSK)	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	X <sup>†</sup>	395
INNOVATOREVMV1	Deluxe Innovator™ Development Kit for OMAP											2,995
TMDXOSK5912	OMAP5912 Starter Kit (DSK)											295
TMDSSP701016A	LF2407A Evaluation Module (EV/M)*	X	X	X	X	X	X	X	X	X	X	1,995
TMDSEZD2407	LF2407A eZdsp™ Starter Kit*	X	X	X	X	X	X	X	X	X	X	295
TMDSEZD2401	LF2401A eZdsp Starter Kit*	X	X	X	X	X	X	X	X	X	X	495
TMDSEZD2812	LF2812 eZdsp Starter Kit*	X	X	X	X	X	X	X	X	X	X	295
TMDSEVZ2812	F2812 eZdsp Starter Kit (DSP in Socket)	X	X	X	X	X	X	X	X	X	X	449
TMDXEZR2812	R2812 eZdsp Starter Kit	X	X	X	X	X	X	X	X	X	X	495
TMDXEZD2808	F2808 eZdsp Starter Kit (DSP in Socket)	X	X	X	X	X	X	X	X	X	X	495
TMDSEVP2812	F2812 Development Bundle (Parallel Port)	X	X	X	X	X	X	X	X	X	X	1,995
TMDSEVU2812	F2812 Development Bundle (USB)	X	X	X	X	X	X	X	X	X	X	2,295
TMDSCCS2000-1	C2000™ DSP Code Composer Studio Development Tools	X	X	X	X	X	X	X	X	X	X	495
TMDSSUB2000	Annual Subscription for C2000 DSP Code Composer Studio	X	X	X	X	X	X	X	X	X	X	3,995
TMDSEMUB60	XDS560™ PCI-Bus High-Performance JTAG Emulator											1,500
TMDSEMUPP	XDS510PP-Plus (Parallel Port) Emulator											495
TMDSEMUUSB	XDS510™ USB-Based Emulator for Windows	X	X	X	X	X	X	X	X	X	X	1,995

X = included    L = Full featured – Limited to 90 days    \* Code developed with Spectrum Digital.  
† ARM code generation tools only.

<sup>†</sup> DSK must be connected for Code Composer Studio to run.

<sup>§</sup> Available only in Texas Instruments eStore.

<sup>¶</sup> Includes 90-day free evaluation tools.

## TI DSP Third Party Network

**A Wide Variety of DSP Solutions**

Utilize the TI Third Party Network for:

- **Complete solutions** – Third-party companies offer complete solutions for quickly solving application problems. Many solutions incorporate TI's data converters and power management devices.
- **Reduced time-to-market** – Time-consuming programming and troubleshooting tasks can be eliminated by utilizing proven hardware, software, algorithms and libraries from third parties.
- **Lower costs** – Don't spend time and money recreating something that has already been produced. Third parties allow you to dedicate your resources to producing value-added, application-specific products.
- **Additional expertise** – Third-party companies provide consulting services, training, integration, contract engineering, research and development and much more. They are an extra resource for project assistance.

**eXpressDSP™-Compliant Third-Party Products**

Texas Instruments in conjunction with its industry-leading DSP Third Party Network offer an array of

eXpressDSP-compliant algorithms designed to reduce system integration time and lower support and development costs by eliminating custom coding tasks. Third parties also provide eXpressDSP-compliant plug-in tools to reduce development time. For a complete listing of algorithms and plug-ins, visit [www.ti.com/algorithms](http://www.ti.com/algorithms)

**DSP Third Party Network Overview**

More than 700 independent third parties provide a vital link between TI silicon and the final application by providing additional hardware, algorithms and libraries, software tools and consulting services. Products/services include:

- eXpressDSP™-compliant algorithms and libraries for a variety of applications such as voice, audio, video, imaging, telecommunications, speech, biometrics, encryption, motor control, as well as others.
- Hardware includes emulators, device programmers and development boards. Development systems include logic analyzers, TIM modules, data acquisition boards, multiprocessing OEM boards and add-on cards.
- Software tools include simulators, debuggers and software development utilities such as filters, signal analyzers, C-code generators and eXpressDSP-compliant plug-ins for Code Composer Studio™ Development Tools.
- Consulting services include turnkey designs, hardware and software integration, training, research and development.

**Third Party Product Catalog on TI's Website**

For information regarding the vast array of products available from TI's Third Party Network, check out: [www.ti.com/thirdpartycatalog](http://www.ti.com/thirdpartycatalog). Extensive information can be found through searchable listings of worldwide TI third parties. Search hundreds of listings by company, device supported, keyword, product name or product category.

**Third Party Network Logo Indicates TMS320™ DSP-Based Solution**

Registered TI Third Party Network members use a distinctive Third Party Network logo on various printed and electronic collateral. Look for the logo to identify companies that are ready to provide a TMS320 DSP-based solution.

**eXpressDSP-Compliant Logo Indicates TMS320 DSP Algorithm Standard Compliance**

Third Party Network members use the eXpressDSP compliance logo in various communications. The logo identifies companies ready to provide products that have passed the standards for application interoperability and reuse.

**Video/Imaging and Audio**

- Compression software
- Research and development support
- Hardware and reference designs
- Enhancement libraries
- Print head control software

**Getting Started with DSP**

- On-site customized training
- Contract engineering design resources
- Subsystem development
- Software experts in applications: embedded control, set-top box, optical networking, digital radio, telematics, biometrics

**Comprehensive Development Support**

- DSP boards, starter kits and add-ons
- Customized debuggers
- Targeted development platforms
- Real-time emulation
- Consulting services
- Simulation models

**Communications**

- Modem and DSL software
- Encryption software
- Voice and fax software
- Wireless software
- Real-time operating systems (RTOS)
- Hardware and reference designs
- Consultants

**DSP Solutions to Reduce Development Time**

## Third Parties Providing eXpressDSP™-Compliant Algorithms

Get the most updated information on eXpressDSP-compliant algorithms at: [www.ti.com/algorithms](http://www.ti.com/algorithms)

### What are eXpressDSP-Compliant Algorithms?

eXpressDSP-compliant algorithms adhere to the rules set forth in TI's TMS320™ DSP Algorithm Standard. Each algorithm is passed through a rigorous automated test before receiving the right to be described as compliant. Pages 64–71 list many of the currently available compliant algorithms and plug-ins from TI third parties.

TI's extensive Third Party Network includes companies that develop eXpressDSP-compliant algorithms based on the TMS320 DSP Algorithm Standard. These algorithm developers provide both proprietary solutions and software that adheres to organizational standards for an array of applications. Our third parties offer

eXpressDSP-compliant solutions for Audio, Digital Motor Control (DMC), Fax, Protocol Stacks, Security, Speech, Telephony, Voiceband (VB) Modems, Video & Imaging, Vocoder and Wireless applications across the TMS320C2000™, TMS320C5000™ and TMS320C6000™ DSP platforms.

For more information on compliant algorithms offered by our TI DSP Third Parties, please access the on-line TI DSP Third Party Catalog at [www.ti.com/algorithms](http://www.ti.com/algorithms). You can also send an e-mail to [3pquery@list.ti.com](mailto:3pquery@list.ti.com) to inquire about any eXpressDSP-compliant algorithms you may be interested in.

Third Party	3P Website	TI DSP Device			Application									
		C2000™	C5000™	C6000™	Audio	DMC	Fax	Protocol Stacks	Security	Speech	Telephony	VB Modems	Video & Imaging	Vocoders
Acoustic Technologies, Inc.	<a href="http://www.acoustictech.com">www.acoustictech.com</a>	X		X							X			
Adaptive Digital Technologies, Inc.	<a href="http://www.adt-inc.com">www.adt-inc.com</a>		X								X			X
Advanced Recognition Technologies, Inc.	<a href="http://www.artcomp.com">www.artcomp.com</a>	X									X			
Alango	<a href="http://www.alango.com/">www.alango.com/</a>	X		X										
Aliph Com	<a href="http://www.aliph.com">www.aliph.com</a>	X		X										
ATEME	<a href="http://www.ateme.fr">www.ateme.fr</a>	X	X	X									X	
Bayer DSP	<a href="http://www.dsp-bayer.com">www.dsp-bayer.com</a>	X					X				X			X
Clarity, LLC	<a href="http://www.clarityco.com">www.clarityco.com</a>	X							X					
Commetrex Corp.	<a href="http://www.commetrex.com">www.commetrex.com</a>	X	X			X				X			X	
Creative DSP Solutions, Inc.	<a href="http://www.creativedsp.com">www.creativedsp.com</a>	X		X										
CuTe Solutions	<a href="http://www.cutесolinc.com/">www.cutесolinc.com/</a>			X	X									
Cybernetics Infotech	<a href="http://www.cybit.com">www.cybit.com</a>	X											X	
D2 Technologies, Inc.	<a href="http://www.d2tech.com">www.d2tech.com</a>	X									X		X	
D+R Electronika B.V.	<a href="http://www.d-r.nl">www.d-r.nl</a>			X	X									
DACS Software Pvt. Ltd.	<a href="http://www.dacsindia.com">www.dacsindia.com</a>	X									X			
Dilithium Networks	<a href="http://www.dilithiumnetworks.com">www.dilithiumnetworks.com</a>			X	X							X		
DSP Wizard	<a href="http://www.dspwizard.com">www.dspwizard.com</a>	X												X
DSpecialists GmbH	<a href="http://www.dspecialists.de">www.dspecialists.de</a>	X	X	X										
easytools s.l.	<a href="http://www.easytools.es">www.easytools.es</a>	X							X					
Emuzed, Inc.	<a href="http://www.emuzed.com">www.emuzed.com</a>	X	X									X		X
Encore Software Ltd.	<a href="http://www.ncoretech.com">www.ncoretech.com</a>	X	X											X
Enounce, Inc.	<a href="http://www.enounce.com">www.enounce.com</a>	X			X									
eSecurium	<a href="http://www.esecurium.com">www.esecurium.com</a>	X						X						
Ethentica by Security First Corp.	<a href="http://www.ethentica.com">www.ethentica.com</a>	X						X				X		
Fonix Corp.	<a href="http://www.fonix.com">www.fonix.com</a>	X								X				
Fraunhofer IIS	<a href="http://www.iis.fhg.de">www.iis.fhg.de</a>			X	X									
GAQ Research, Inc.	<a href="http://www.gaoresearch.com">www.gaoresearch.com</a>	X							X	X	X		X	
Global IP Sound AB	<a href="http://www.globalipsound.com">www.globalipsound.com</a>	X											X	
HelloSoft, Inc.	<a href="http://www.hellosoft.com">www.hellosoft.com</a>		X								X		X	X
IdenCom	<a href="http://www.idencom.com/">www.idencom.com/</a>			X					X				X	
IdentAlink	<a href="http://www.identalink.de/">www.identalink.de/</a>			X					X				X	
ILLICO	<a href="http://www.illico.com">www.illico.com</a>	X	X			X						X		
Ingenient Technologies, Inc.	<a href="http://www.ingenient.com">www.ingenient.com</a>	X	X	X					X	X	X		X	X
Ittiam Systems Private Limited	<a href="http://www.ittiam.com">www.ittiam.com</a>	X	X	X					X			X	X	

## Third Parties Providing eXpressDSP™-Compliant Algorithms



Third Party	3P Website	TI DSP Device			Application									
		C2000™	C3000™	C6000™	Audio	DMC	Fax	Protocol Stacks	Security	Speech	Telephony	VB Modems	Video & Imaging	Vocoders
Mango DSP, Ltd.	<a href="http://www.mangodsp.com">www.mangodsp.com</a>			X								X		
Mecoso Technology, Inc.	<a href="http://www.mecoso.com">www.mecoso.com</a>			X								X		
MESi	<a href="http://www.mesi.net">www.mesi.net</a>	X					X				X	X		
Motorola (BlueWave Systems)	<a href="http://www.bluews.com">www.bluews.com</a>			X							X			X
National Instruments / Hyperception	<a href="http://www.ni.com">www.ni.com</a>	X	X						X				X	
Netbricks	<a href="http://www.netbricks.net/">www.netbricks.net/</a>		X							X				
NeuroDynamics, Ltd.	<a href="http://www.neurodynamics.com">www.neurodynamics.com</a>	X						X				X		
NeuVoice	<a href="http://www.neuvoice.com">www.neuvoice.com</a>		X							X				
Noise Cancellation Technology (NCT)	<a href="http://www.nctclearspeech.com/">www.nctclearspeech.com/</a>		X				X							
NTRU Cryptosystems, Inc.	<a href="http://www.ntru.com">www.ntru.com</a>		X					X						
Octiv, Inc.	<a href="http://www.octiv.com">www.octiv.com</a>	X		X										
On2 Technologies	<a href="http://www.on2.com">www.on2.com</a>			X									X	
Pivot Signal Processing, Ltd.	<a href="http://www.pivot-dsp.com">www.pivot-dsp.com</a>			X				X		X				X
Planning Systems, Inc.	<a href="http://www.plansys.com">www.plansys.com</a>	X							X					
Prodys S.L.	<a href="http://www.prodys.net">www.prodys.net</a>			X									X	
RadiSys Corp.	<a href="http://www.radisys.com">www.radisys.com</a>			X							X			X
Sasken Communication Technologies Ltd.	<a href="http://www.sasken.com">www.sasken.com</a>	X											X	
SIAL Ltd.	<a href="http://www.dsp.sut.ru/sial/">www.dsp.sut.ru/sial/</a>	X	X								X			X
Siemens AG Austria	<a href="http://www.pse.siemens.at">www.pse.siemens.at</a>	X		X										
Signals + Software Ltd.	<a href="http://www.signalsandsoftware.com">www.signalsandsoftware.com</a>	X	X				X			X	X			X
SignalWorks	<a href="http://www.signalworks.com">www.signalworks.com</a>	X		X										
Snapshield Ltd.	<a href="http://www.snapshield.com">www.snapshield.com</a>	X	X					X						
Softier Ltd.	<a href="http://www.softier.com/">www.softier.com/</a>			X									X	X
Sound ID	<a href="http://www.soundid.com">www.soundid.com</a>	X		X										
Spatializer Audio Laboratories, Inc.	<a href="http://www.spatializer.com">www.spatializer.com</a>	X		X										
Spectrum Signal Processing, Inc.	<a href="http://www.spectrumsignal.com">www.spectrumsignal.com</a>	X								X				
Speech Technology Center	<a href="http://www.speechpro.com">www.speechpro.com</a>	X									X			
SPIRIT CORP.	<a href="http://www.spiritDSP.com">www.spiritDSP.com</a>	X		X		X		X		X	X	X		X
SRS Labs, Inc.	<a href="http://www.srslabs.com">www.srslabs.com</a>	X	X	X										
SURF Communication Solutions Ltd.	<a href="http://www.surf-com.com">www.surf-com.com</a>			X			X					X		X
Technosoft	<a href="http://www.technosoft.ch/">www.technosoft.ch/</a>	X				X								
Treck, Inc.	<a href="http://www.treck.com">www.treck.com</a>	X	X					X						
Two Pi	<a href="http://www.two-pi.com/">www.two-pi.com/</a>	X		X										
UB Video, Inc.	<a href="http://www.ubvideo.com">www.ubvideo.com</a>	X	X										X	
UFMG-Universidade Federal de Minas Gerais	<a href="http://www.cpdee.ufmg.br">www.cpdee.ufmg.br</a>	X				X								
Verance Corp.	<a href="http://www.verance.com">www.verance.com</a>		X						X					
Wavemakers, Inc.	<a href="http://www.wavemakers.com">www.wavemakers.com</a>	X						X						
Windmill Innovations	<a href="http://www.windmill-innovations.com">www.windmill-innovations.com</a>		X	X				X						
Wipro Ltd.	<a href="http://www.wipro.com">www.wipro.com</a>		X										X	

## eXpressDSP™-Compliant Third-Party Algorithms

Get the most updated information on eXpressDSP-compliant algorithms at: [www.ti.com/algorithms](http://www.ti.com/algorithms)

### AUDIO

Compliant Algorithm	Generation	Third-Party Vendor
3D Stereo	C54x	Spatializer Audio Labs
3D Stereo	C55x	Spatializer Audio Labs
AAC Decoder	C54x	Ingenient Technologies
AAC Decoder	C55x	SPIRIT CORP.
AAC Decoder	C62x	Ingenient Technologies
AAC Decoder	C62x	SPIRIT CORP.
AAC Decoder	C64x	SPIRIT CORP.
AAC Encoder	C62x	Ingenient Technologies
Acoustic Echo Canceller	C54x	Creative DSP Solutions
Acoustic Echo Canceller	C54x	Ingenient Technologies
Acoustic Echo Canceller	C54x	Indesign
Acoustic Echo Canceller	C54x	SPIRIT CORP.
Acoustic Echo Canceller	C55x	Creative DSP Solutions
Acoustic Echo Canceller	C55x	Ingenient Technologies
Acoustic Echo Canceller	C55x	SPIRIT CORP.
Acoustic Echo Canceller	C64x	Ingenient Technologies
Adaptive Noise Canceller	C54x	DSPecialists GmbH
ASF-M	C54x	NCT Group
Chorus	C67x	Spectral Design
Circle Surround II	C67x	SRS Labs
Compressor	C67x	DSPecialists GmbH
Dialog	C55x	SRS Labs
Equalizer	C67x	DSPecialists GmbH
FEX_C5	C54x	Conversay
Flanger	C67x	DSPecialists GmbH
Full Duplex Echo Cancellation	C54x	SignalWorks
Full Spectrum Dynamic Compression	C54x	Sound ID
Function Generator	C67x	DSPecialists GmbH
Headphones	C54x	Spatializer Audio Labs
Headphones	C55x	Spatializer Audio Labs
Mixer	C67x	DSPecialists GmbH
Mono Eq 4 Band	C67x	D+R Electronika B.V.
MP3 Decoder	C28x	SPIRIT CORP.
MP3 Decoder	C54x	SPIRIT CORP.
MP3 Decoder	C54x	Ittiam Systems
MP3 Decoder	C55x	SPIRIT CORP.
MP3 Decoder Gold	C54x	CuTe Solutions
MP3 Decoder Silver	C54x	CuTe Solutions
MP3 Encoder	C54x	Ingenient Technologies
MP3 Encoder	C54x	CuTe Solutions
MP3 Encoder	C55x	Ingenient Technologies
MP3 Encoder	C55x	CuTe Solution
MP3 Encoder	C62x	CuTe Solution
MP3 Encoder	C62x	Ingenient Technologies
MP3 Encoder	C62x	CuTe Solution
MPEG2 AAC Encoder	C67x	Fraunhofer IIS
MPEG2 L3 Decoder	C54x	Ingenient Technologies
MPEG2 L3 Decoder	C55x	Ingenient Technologies
MPEG2 L3 Decoder	C62x	Ingenient Technologies

### AUDIO (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
MPEG2/4 AAC Decoder	C64x	ATEME
MPEG2/4 AAC Decoder	C64x	Ittiam Systems
MPEG2/4 AAC Encoder	C64x	ATEME
MPEG2/4 AAC Encoder	C64x	Ittiam Systems
MPEG4 AAC LC Decoder	C54x	Ingenient Technologies
MPEG4 AAC LC Decoder	C55x	Ingenient Technologies
MPEG4 AAC LC Encoder	C62x	Ingenient Technologies
MPEG4 AAC LC Encoder	C64x	Ingenient Technologies
MPEG4 Decoder	C55x	Ingenient Technologies
Noise Reduction	C54x	Creative DSP Solutions
Noise Reduction	C55x	Creative DSP Solutions
Noise Reduction, Low Frequency	C54x	Alango
Octimax	C54x	Octiv
Octivox	C54x	Octiv
Pathfinder Noise Suppression	C55x	Aliph Com
Phase Corrected Equalization	C55x	Spatializer Audio Labs
Reverb	C67x	DSPecialists GmbH
Sample Rate Conversion	C54x	Siemens AG Austria
Speech Compressor for Hearing Aids	C54x	Two Pi
Time-Scale Tailor	C54x	Enounce
Vi.B.ET™	C54x	Spatializer Audio Labs
Vi.B.E	C55x	Spatializer Audio Labs
VoIP	C54x	SPIRIT CORP.
VoIP	C55x	SPIRIT CORP.
VIP – Voice Intelligibility	C54x	SRS Labs
VIP – Voice Intelligibility	C55x	SRS Labs
WMA Decoder	C54x	Ingenient Technologies
WMA Decoder	C55x	CuTe Solution
WOW – Voice	C54x	SRS Labs
WOW – Voice	C55x	SRS Labs

### DIGITAL MOTOR CONTROL (DMC)

Compliant Algorithm	Generation	Third-Party Vendor
Position Control	C24x	Technosoft
RMS Signal Measurement	C24x	RACOM Microelectronics
Speed Control	C24x	Technosoft
Torque Control for BLDC	C24x	Technosoft
Torque Control for IMVC	C24x	Technosoft
Torque Control for PMSM	C24x	Technosoft
Vector PWM for Neutral Point Clamped 3 Level Inverters	C24x	UFMG

### FAX

Compliant Algorithm	Generation	Third-Party Vendor
FAX Bundle (V.17/V.21/V.27/V.29)	C54x	SPIRIT CORP.
FAX G3 Rev 1.0 (V.21/V.27V.29)	C54x	SPIRIT CORP.
T.38 Fax Relay over IP	C54x	SPIRIT CORP.
T.38 Fax Relay over IP	C62x	SURF Communication Solns.
V.17	C54x	SPIRIT CORP.
V.17 Receive	C54x	MESi

## eXpressDSP™-Compliant Third-Party Algorithms



### FAX (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
V.17 Receive	C62x	Commetrex
V.17 Receive	C62x	ILLICO
V.17 Transmit	C54x	ILLICO
V.17 Transmit	C54x	MESi
V.17 Transmit	C62x	Commetrex
V.21	C54x	SPIRIT CORP.
V.21 Receive	C54x	MESi
V.21 Receive	C62x	Commetrex
V.21 Transmit	C54x	ILLICO
V.21 Transmit	C54x	MESi
V.21 Transmit	C62x	Commetrex
V.27 Receive	C54x	ILLICO
V.27 Transmit	C54x	ILLICO
V.27/V.29 Receive	C62x	Commetrex
V.27/V.29 Transmit	C62x	Commetrex
V.27ter	C54x	SPIRIT CORP.
V.27ter Receive	C54x	MESi
V.27ter Transmit	C54x	MESi
V.29	C54x	SPIRIT CORP.
V.29 Receive	C54x	ILLICO
V.29 Receive	C54x	MESi
V.29 Transmit	C54x	ILLICO
V.29 Transmit	C54x	MESi
V.29 Transmit/Receive	C54x	GAO Research Inc.

### PROTOCOL STACKS

Compliant Algorithm	Generation	Third-Party Vendor
HDLC Generator Level 2	C54x	Bayer DSP
HDLC Receiver	C55x	Bayer DSP
HDLC Receiver Level 2	C54x	Bayer DSP
HDLC Transmitter	C55x	Bayer DSP
Serial Communications Protocol	C54x	Windmill Innovations
Serial Communications Protocol	C55x	Windmill Innovations
Serial Communications Protocol	C67x	Windmill Innovations
TCP/IP Protocol Stack	C54x	Windmill Innovations
TCP/IP Protocol Stack for Ethernet	C62x	Windmill Innovations
TCP/IP Protocol Stack for Ethernet	C67x	Windmill Innovations
Treck	C55x	Treck
Treck	C62x	Treck

### SECURITY

Compliant Algorithm	Generation	Third-Party Vendor
3-DES	C54x	Ingenient Technologies
3-DES	C54x	Snapshield
3-DES	C55x	Ingenient Technologies
3-DES	C55x	Snapshield
AES	C54x	Snapshield
AES	C55x	Snapshield
AES	C62x	Snapshield
AES	C64x	Snapshield
Audio Watermark Det. SDMI Screen	C54x	Verance Corp.
BioKey	C62x	IdenCom
Biometrics Image Processing	C55x	Ethentica

### SECURITY (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
DES	C54x	Ingenient Technologies
DES	C54x	Snapshield
DES	C55x	Ingenient Technologies
DES CBC Mode	C54x	Snapshield
Diffie-Hellman	C54x	Snapshield
Diffie-Hellman	C55x	Snapshield
Diffie-Hellman	C62x	Snapshield
ELGAMAL	C54x	Snapshield
ELGAMAL	C62x	Snapshield
Fingerprint 1 to 1	C54x	NeuroDynamics
Fingerprint Recognition Pre	C62x	IdentAlink
Fingerprint Recognition Engine	C62x	IdentAlink
HMAC	C54x	Ingenient Technologies
HMAC-MD5	C54x	Snapshield
HMAC-SHA-1	C54x	Snapshield
IDEA Decryption	C54x	easytools
IDEA Encryption	C54x	easytools
Kasumi Encryption	C67x	Pivot Signal Processing
MD5	C54x	Snapshield
MD5	C55x	Snapshield
MD5	C62x	Snapshield
MD5-V2.0	C62x	Snapshield
MMH-MAC	C62x	Snapshield
NTRU Mobile Security	C55x	NTRU Cryptosystems
RSA	C54x	Snapshield
RSA1024	C54x	eSecurium
SHA-1	C54x	Snapshield
SHA-1	C55x	Snapshield
SHA-1	C62x	Snapshield

### SPEECH

Compliant Algorithm	Generation	Third-Party Vendor
Adaptive Speech Filter (Enhancement)	C67x	NCT Group, Inc.
Broadband Noise Cancellation	C54x	Speech Technology Center
Caller ID Text-to-Speech	C55x	Fonix
Clear Voice Capture Dual-Element Mic	C54x	Clarity
Clear Voice Capture Single-Element Mic	C54x	Clarity
MPEG4 HVXC Speech Decoder	C54x	Ittiam Systems
MPEG4 HVXC Speech Encoder	C54x	Ittiam Systems
Real World Voice Recognition	C54x	NeuVoice
Real World Voice Recognition	C55x	NeuVoice
Referenced Noise Filter	C67x	NCT Group, Inc.
smARTspeak NG	C55x	Advanced Recognition Tech.
smARTspeak XG	C55x	Advanced Recognition Tech.
Sound Stretcher	C54x	Speech Technology Center
Speech Enhancement	C54x	SPIRIT CORP.
Text-to-Speech Synthesizer	C55x	Fonix
VoCon Speech Recognition Engine	C54x	Philips Speech Processing
Voice Command Recognition	C54x	Speech Technology Center
Voiceguard – Adapt	C54x	Planning Systems, Inc.
Voiceguard – Adapt	C55x	Planning Systems, Inc.
Voiceguard – HAB	C54x	Planning Systems, Inc.
Voiceguard – HAB	C55x	Planning Systems, Inc.

## eXpressDSP™-Compliant Third-Party Algorithms

## SPEECH (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
VoiceTrigger	C54x	Wavemakers
Voice Recognition	C55x	Advanced Recognition Tech.

## TELEPHONY

Compliant Algorithm	Generation	Third-Party Vendor
2100-Hz Tone Detector	C62x	Signals + Software
Acoustic Echo Canceller	C54x	SPIRIT CORP.
Auto Gain Control/Voice Activity Det	C62x	RadiSys Corp.
Automatic Gain Control	C54x	Ingenient Technologies
Automatic Gain Control	C54x	SPIRIT CORP.
Automatic Gain Controller	C62x	Signals + Software
Automatic Gain Control	C64x	Ingenient Technologies
Call Progress Analysis	C54x	Commetrex
Call Progress Analysis	C62x	Commetrex
Call Progress Decoder	C54x	Ingenient Technologies
Call Progress Detector	C54x	SPIRIT CORP.
Call Progress Generator	C54x	SPIRIT CORP.
Call Progress Monitor	C62x	RadiSys Corp.
Call Progress Tone Detector	C54x	Adaptive Digital Technologies
Caller ID	C54x	Ingenient Technologies
Caller ID	C54x	SPIRIT CORP.
Caller ID Detector	C54x	MESi
Caller ID Detector	C54x	SPIRIT CORP.
Caller ID Generator	C54x	MESi
Caller ID Generator	C54x	SPIRIT CORP.
Caller ID Receiver	C62x	Commetrex
Caller ID Transmitter	C54x	Commetrex
Caller ID Transmitter	C62x	Commetrex
Caller ID, Type 1 and 2	C54x	GAO Research Inc.
Comfort Noise Generator	C54x	SPIRIT CORP.
Comfort Noise Generator	C62x	RadiSys Corp.
CPE Alert Signal	C54x	D2 Technologies
CPT Detector	C54x	Bayer DSP
CPT Detector	C55x	Bayer DSP
CPT Generator	C54x	Bayer DSP
CPT Generator	C55x	Bayer DSP
DTMF	C54x	D2 Technologies
DTMF	C54x	SPIRIT CORP.
DTMF	C62x	Spectrum Signal Processing
DTMF Detector	C54x	Adaptive Digital Technologies
DTMF Detector	C54x	Commetrex
DTMF Detector	C54x	Ingenient Technologies
DTMF Detector	C54x	MESi
DTMF Detector	C62x	Commetrex
DTMF Detector / Suppressor	C62x	RadiSys Corp.
DTMF Encoder	C54x	Ingenient Technologies
DTMF Encoder/Decoder	C54x	Ingenient Technologies
DTMF Generator	C54x	Commetrex
DTMF Generator	C54x	MESi
DTMF Generator	C54x	SPIRIT CORP.
DTMF Generator	C62x	Commetrex
DTMF Receiver	C54x	Bayer DSP
DTMF Receiver	C54x	Signals + Software

## TELEPHONY (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
DTMF Receiver	C54x	SIAL
DTMF Receiver	C54x	SPIRIT CORP.
DTMF Receiver	C55x	Bayer DSP
DTMF Receiver	C62x	Motorola Computer Group
DTMF Transmitter	C54x	Bayer DSP
DTMF Transmitter	C54x	Signals + Software
DTMF Transmitter	C55x	Bayer DSP
DTMF Transmitter	C62x	Motorola Computer Group
DTMF Transmitter	C62x	Signals + Software
Echo Cancellation, Multi-	C54x	D2 Technologies
Echo Canceller	C54x	Ingenient Technologies
Echo Canceller	C55x	Ingenient Technologies
Echo Canceller	C62x	Ingenient Technologies
Echo Canceller	C64x	Ingenient Technologies
Fax and Modem Tone Detect	C54x	D2 Technologies
Frequency Shift Key Rec	C54x	D2 Technologies
Frequency Shift Key Send	C54x	D2 Technologies
G.165	C54x	Bayer DSP
G.165	C54x	SPIRIT CORP.
G.165	C55x	Bayer DSP
G.165 Line Echo Cancellation	C62x	RadiSys Corp.
G.167	C54x	Bayer DSP
G.167	C55x	Bayer DSP
G.168	C54x	DACS Software
G.168	C54x	Ingenient Technologies
G.168	C55x	Ingenient Technologies
G.168	C62x	Ingenient Technologies
G.168	C64x	Ingenient Technologies
G.168 (Long Tail)	C54x	Adaptive Digital Technologies
G.168 (Long Tail)	C55x	Adaptive Digital Technologies
G.168 (Long Tail)	C64x	Adaptive Digital Technologies
G.168 (Short Tail)	C54x	Adaptive Digital Technologies
G.168 (Short Tail)	C55x	Adaptive Digital Technologies
G.168-2000	C54x	SPIRIT CORP.
G.168-2000	C55x	SPIRIT CORP.
LEC-128-HelloVoice™ Line Echo	C55x	HelloSoft
Line Echo Canceller	C55x	HelloSoft
MF R1 Detector	C54x	Adaptive Digital Technologies
MF R2 Forward Detector	C54x	Adaptive Digital Technologies
MF R2 Reverse Detector	C54x	Adaptive Digital Technologies
MF Line/Register Signaling	C62x	RadiSys Corp.
Multifrequency Tone Detect	C54x	D2 Technologies
Music On Hold	C54x	Bayer DSP
Noise Floor Estimation	C54x	D2 Technologies
Non-Linear Processing	C54x	D2 Technologies
SoundClear Echo Cancel & Noise Red	C54x	Acoustic Technologies
SoundClear Echo Cancel & Noise Red	C55x	Acoustic Technologies
TMWRTW	C67x	Ingenient Technologies
Tone Detector	C54x	Commetrex
Tone Detector	C54x	MESi
Tone Detector	C62x	Commetrex

## eXpressDSP™-Compliant Third-Party Algorithms



### TELEPHONY (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
Tone Detector	C64x	Commetrex
Tone Disabler for LEC	C54x	SPIRIT CORP.
Tone Generator	C54x	Commetrex
Tone Generator	C54x	D2 Technologies
Tone Generator	C54x	MESI
Tone Generator	C62x	Commetrex
Tone Generator	C62x	RadiSys Corp.
Universal Tone Detection	C54x	D2 Technologies
Univ Multifrequency Tone Generator	C54x	SPIRIT CORP.
Univ Multifrequency Tone Generator	C55x	SPIRIT CORP.
Variable Rate Conv. CODEC w/ Soft Decision VITERBI Decoding	C54x	Ingenient Technologies
Voice Activity Detector	C62x	RadiSys Corp.
Voice Activity Detection	C54x	Ingenient Technologies
Voice Activity Detection	C54x	SPIRIT CORP.
Voice Activity Detection	C55x	Ingenient Technologies
Voice Activity Detection	C62x	Ingenient Technologies
Voice Activity Detection	C64x	Ingenient Technologies
Voice Activity Detector	C54x	D2 Technologies
Voice Activity Detector	C62x	Signals + Software

### VB MODEM

Compliant Algorithm	Generation	Third-Party Vendor
AGC	C54x	Ingenient Technologies
AGC	C54x	SPIRIT CORP.
BELL 103 Modem (demod)	C54x	MESI
BELL 103 Modem (mod)	C54x	MESI
BELL 202 Modem (demod)	C54x	MESI
BELL 202 Modem (mod)	C54x	MESI
Binary Phase Shift Key Modem	C54x	Ingenient Technologies
Binary Phase Shift Key Modem	C64x	Ingenient Technologies
DTMF Generator	C54x	Ingenient Technologies
G3MDP	C54x	SPIRIT CORP.
Soft Modem (Medium speed)	C54x	Netbricks
UPD Fax/Modem Pumps	C55x	SPIRIT CORP.
UPD Modem Pumps	C55x	SPIRIT CORP.
UDP V.23 Fax/Modem Pumps	C55x	SPIRIT CORP.
Univ Multifrequency Tone Detect	C54x	SPIRIT CORP.
Univ Multifrequency Tone Detect	C55x	SPIRIT CORP.
V.21 Receive	C54x	ILLICO
V.21 Transmit/Receive	C54x	GAO Research Inc.
V.22	C54x	Ingenient Technologies
V.22 bis Transmit/Receive	C54x	GAO Research Inc.
V.22 bis Transmit/Receive	C54x	MESI
V.23 Receive	C54x	MESI
V.23 Transmit	C54x	MESI
V.23 Transmit/Receive	C54x	GAO Research Inc.
V.32 / V.32 bis / V.22 / V.22 bis	C54x	SPIRIT CORP.
V.32 bis	C54x	GAO Research Inc.
V.32 bis	C54x	MESI
V.32 bis	C54x	SPIRIT CORP.
V.32 Transmit/Receive	C54x	ILLICO
V.34 Data Pump	C54x	GAO Research Inc.

### VB MODEM (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
V.34/V.34+	C62x	SURF Communication Solns.
V.42	C54x	SPIRIT CORP.
V.42 bis	C54x	GAO Research Inc.
V.42 bis	C54x	SPIRIT CORP.
V.42 bis Decoder	C62x	Signals + Software
V.42 bis Encoder	C62x	Signals + Software
V.90	C62x	SURF Communication Solns.
V.90 Data Pump	C54x	GAO Research Inc.
V.150	C64x	SURF Communication Solns.

### VIDEO & IMAGING

Compliant Algorithm	Generation	Third-Party Vendor
Digital Video-25	DM64x	Mecoso Technology
H.261 Decoder	C62x	UB Video
H.261 Encoder	C62x	UB Video
H.263 Decoder	C62x	Dilithium Networks
H.263 Decoder	C62x	Mecoso Technology
H.263 Decoder Ver 1.0	C62x	UB Video
H.263 Decoder Ver 2.0	C62x	UB Video
H.263 Encoder	C55x	Emuzed
H.263 Encoder	C62x	Emuzed
H.263 Encoder	C62x	Mecoso Technology
H.263 Encoder	C64x	Emuzed
H.263 Encoder Ver 1.0	C62x	UB Video
H.263 Encoder Ver 2.0	C62x	UB Video
H.263 TDM to/from H.263 TCP/IP	C62x	Dilithium Networks
JPEG Codec	C54x	ATEME
JPEG Codec	C55x	ATEME
JPEG Codec	C62x	ATEME
JPEG Codec	DM64x	Mecoso Technology
JPEG Decoder	C54x	ATEME
JPEG Decoder	C55x	ATEME
JPEG Decoder	C55x	Emuzed
JPEG Decoder	C62x	ATEME
JPEG Decoder	C64x	ATEME
JPEG Encoder	C54x	ATEME
JPEG Encoder	C55x	ATEME
JPEG Encoder	C55x	Emuzed
JPEG Encoder	C62x	ATEME
JPEG Encoder	C62x	Mango DSP
JPEG Encoder	C64x	ATEME
MJPEG Codec	C54x	ATEME
MJPEG Codec	C55x	ATEME
MJPEG Codec	C62x	ATEME
MJPEG Codec	DM64x	Mecoso Technology
MJPEG Decoder	C54x	ATEME
MJPEG Decoder	C55x	ATEME
MJPEG Decoder	C62x	ATEME
MJPEG Decoder	C62x	Mecoso Technology
MJPEG Encoder	C54x	ATEME
MJPEG Encoder	C55x	ATEME
MJPEG Encoder	C62x	ATEME
MPEG1 Decoder	C62x	Mecoso Technology
MPEG1 Encoder	C62x	Mecoso Technology

## eXpressDSP™-Compliant Third-Party Algorithms

## VIDEO &amp; IMAGING (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
MPEG2 Decoder	C62x	ATEME
MPEG2 Decoder	C64x	ATEME
MPEG4 Adv. Simple Profile Decoder	C62x	Ingenient Technologies
MPEG4 Adv. Simple Profile Encoder	C62x	Ingenient Technologies
MPEG4 Adv. Simple Profile Encoder	C64x	Prodys
MPEG4 ASP Level 4 Encoder	C64x	Prodys
MPEG4 Core Profile Encoder	C64x	Prodys
MPEG4 Decoder	C55x	Sasken Communication Tech.
MPEG4 Decoder	C55x	UB Video
MPEG4 Decoder	C62x	ATEME
MPEG4 Decoder	C62x	Dilithium Networks
MPEG4 Decoder	C62x	Mecoso Technology
MPEG4 Decoder	C64x	ATEME
MPEG4 Encoder	C55x	UB Video
MPEG4 Encoder	C62x	Mecoso Technology
MPEG4 Encoder	C64x	Prodys
MPEG4 Simple Profile	C64x	Ittiam Systems
MPEG4 Simple Profile Decoder	C62x	Ingenient Technologies
MPEG4 Simple Profile Decoder	C62x	Prodys
MPEG4 Simple Profile Decoder	C64x	Ingenient Technologies
MPEG4 Simple Profile Decoder	C64x	Prodys
MPEG4 Simple Profile Encoder	C62x	Ingenient Technologies
MPEG4 Simple Profile Encoder	C62x	Prodys
MPEG4 Simple Profile Encoder	C64x	Ingenient Technologies
MPEG4 Simple Profile Encoder	C64x	Prodys
MPEG4 Simple Profile Video Decoder	C55x	Emuzed
MPEG4 Simple Profile Video Decoder	C62x	Prodys
MPEG4 Simple Profile Video Decoder	C64x	Prodys
MPEG4 Simple Profile Video Encoder	C55x	Emuzed
MPEG4 Simple Profile Video Encoder	C62x	Emuzed
MPEG4 Simple Profile Video Encoder	C64x	Emuzed
MPEG4 VSP Decoder	C64x	ATEME
VP4 Decoder	C62x	On2 Technologies
VP4 Decoder	C64x	On2 Technologies

## VOCODERS

Compliant Algorithm	Generation	Third-Party Vendor
1200-BPS Decoder	C54x	SPIRIT CORP.
1200-BPS Encoder	C54x	SPIRIT CORP.
1200-BPS Vocoder	C55x	SPIRIT CORP.
2400-BPS Decoder	C54x	SPIRIT CORP.
2400-BPS Encoder	C54x	SPIRIT CORP.
2400-BPS Vocoder	C55x	SPIRIT CORP.
4800-BPS Vocoder	C54x	SPIRIT CORP.
4800-BPS Vocoder	C55x	SPIRIT CORP.
6000-BPS Vocoder	C54x	SPIRIT CORP.
6000-BPS Vocoder	C55x	SPIRIT CORP.
Enhanced G.711	C54x	Global IP Sound AB
ESAC4 Decoder	C55x	Cybernetics Infotech
ESAC4 Encoder	C55x	Cybernetics Infotech
ESAC7 Decoder	C55x	Cybernetics Infotech
ESAC7 Encoder	C55x	Cybernetics Infotech
G.168	C62x	Signals + Software

## VOCODERS (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
G.711 Decoder	C54x	Commetrex
G.711 Decoder	C54x	Ingenient Technologies
G.711 Decoder	C54x	Signals + Software
G.711 Decoder	C54x	SPIRIT CORP.
G.711 Decoder	C55x	Ingenient Technologies
G.711 Decoder	C55x	SPIRIT CORP.
G.711 Decoder	C62x	Commetrex
G.711 Decoder	C62x	Ingenient Technologies
G.711 Decoder	C62x	Motorola Computer Group
G.711 Decoder	C62x	RadiSys Corp.
G.711 Decoder	C62x	Signals + Software
G.711 Decoder	C64x	Ittiam Systems
G.711 Encoder	C54x	Commetrex
G.711 Encoder	C54x	Ingenient Technologies
G.711 Encoder	C54x	Signals + Software
G.711 Encoder	C54x	SPIRIT CORP.
G.711 Encoder	C55x	Ingenient Technologies
G.711 Encoder	C55x	SPIRIT CORP.
G.711 Encoder	C62x	Commetrex
G.711 Encoder	C62x	Ingenient Technologies
G.711 Encoder	C62x	Motorola Computer Group
G.711 Encoder	C62x	RadiSys Corp.
G.711 Encoder	C62x	Signals + Software
G.711 Encoder	C64x	Ittiam Systems
G.711 PLC	C54x	SPIRIT CORP.
G.711 PLC	C55x	SPIRIT CORP.
G.722 Decoder	C62x	RadiSys Corp.
G.722 Decoder	C62x	Signals + Software
G.722 Decoder	C64x	Ittiam Systems
G.722 Encoder	C62x	RadiSys Corp.
G.722 Encoder	C62x	Signals + Software
G.722 Encoder	C64x	Ittiam Systems
G.722 Encoder	C64x	SIAL
G.722.1 Decoder	C54x	Ittiam Systems
G.722.1 Decoder	C64x	SIAL
G.722.1 Encoder	C54x	SIAL
G.722.1 Encoder	C64x	Ittiam Systems
G.722.2 Decoder	C62x	Pivot Signal Processing
G.723.1	C54x	Encore Software
G.723.1	C54x	GAO Research Inc.
G.723.1	C62x	Encore Software
G.723.1 Decoder	C54x	SPIRIT CORP.
G.723.1 Decoder	C55x	SPIRIT CORP.
G.723.1 Decoder	C62x	RadiSys Corp.
G.723.1 Decoder	C62x	Signals + Software
G.723.1 Decoder	C62x	SPIRIT CORP.
G.723.1 Encoder	C54x	SPIRIT CORP.
G.723.1 Encoder	C55x	SPIRIT CORP.
G.723.1 Encoder	C62x	RadiSys Corp.
G.723.1 Encoder	C62x	Signals + Software
G.723.1 Encoder	C62x	SPIRIT CORP.
G.723.1 Encoder/Decoder	C54x	Adaptive Digital Technologies
G.723.1 Encoder/Decoder	C54x	GAO Research Inc.

## eXpressDSP™-Compliant Third-Party Algorithms



### VOCODERS (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
G.723A Decoder	C54x	D2 Technologies
G.723A Encoder	C54x	D2 Technologies
G.726	C54x	Encore Software
G.726	C62x	Encore Software
G.726 A-Law ADPCM Decoder	C62x	RadiSys Corp.
G.726 A-Law ADPCM Encoder	C62x	RadiSys Corp.
G.726 ADPCM Decoder/Encoder	C54x	SPIRIT CORP.
G.726 ADPCM Decoder/Encoder	C55x	SPIRIT CORP.
G.726 Decoder	C54x	Commetrex
G.726 Decoder	C54x	D2 Technologies
G.726 Decoder	C54x	National Instru./Hyperception
G.726 Decoder	C54x	Ingenient Technologies
G.726 Decoder	C54x	Signals + Software
G.726 Decoder	C54x	SPIRIT CORP.
G.726 Decoder	C55x	DSP Wizard
G.726 Decoder	C55x	SPIRIT CORP.
G.726 Decoder	C62x	Commetrex
G.726 Decoder	C62x	National Instru./Hyperception
G.726 Decoder	C62x	Ingenient Technologies
G.726 Decoder	C62x	Ingenient Technologies
G.726 Decoder	C62x	Signals + Software
G.726 Decoder	C64x	Ittiam Systems
G.726 Decoder (Low MIPS)	C54x	Adaptive Digital Technologies
G.726 Encoder	C54x	Commetrex
G.726 Encoder	C54x	D2 Technologies
G.726 Encoder	C54x	National Instru./Hyperception
G.726 Encoder	C54x	Ingenient Technologies
G.726 Encoder	C54x	Signals + Software
G.726 Encoder	C54x	SPIRIT CORP.
G.726 Encoder	C55x	DSP Wizard
G.726 Encoder	C55x	SPIRIT CORP.
G.726 Encoder	C62x	Commetrex
G.726 Encoder	C62x	National Instru./Hyperception
G.726 Encoder	C62x	Ingenient Technologies
G.726 Encoder	C62x	Ingenient Technologies
G.726 Encoder	C62x	Signals + Software
G.726 Encoder	C64x	Ittiam Systems
G.726 Encoder (Low MIPS)	C54x	Adaptive Digital Technologies
G.726 Encoder/Decoder (Low Memory)	C54x	Adaptive Digital Technologies
G.726 U-Law ADPCM Decoder	C62x	RadiSys Corp.
G.726 U-Law ADPCM Encoder	C62x	RadiSys Corp.
G.726/G.711	C55x	SPIRIT CORP.
G.728	C62x	Encore Software
G.728 Decoder	C54x	Signals + Software
G.728 Decoder	C62x	Signals + Software
G.728 Decoder	C64x	Ittiam Systems
G.728 Encoder	C54x	Signals + Software
G.728 Encoder	C62x	Signals + Software
G.728 Encoder	C64x	Ittiam Systems
C.729	C55x	Wipro
G.729	C62x	Encore Software
G.729 Decoder	C54x	Signals + Software

### VOCODERS (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
G.729 Decoder	C54x	SPIRIT CORP.
G.729 Decoder	C55x	DSP Wizard
G.729 Decoder	C55x	SPIRIT CORP.
G.729 Decoder	C62x	RadiSys Corp.
G.729 Decoder	C62x	Signals + Software
G.729 Decoder	C62x	SIAL
G.729 Decoder	C62x	SURF Communication Solns.
G.729 Encoder	C54x	Signals + Software
G.729 Encoder	C54x	SPIRIT CORP.
G.729 Encoder	C55x	DSP Wizard
G.729 Encoder	C55x	SPIRIT CORP.
G.729 Encoder	C62x	RadiSys Corp.
G.729 Encoder	C62x	Signals + Software
G.729 Encoder	C62x	SIAL
G.729 Encoder	C62x	SURF Communication Solns.
G.729 Encoder/Decoder	C54x	Adaptive Digital Technologies
G.729A	C54x	Encore Software
G.729A Decoder	C54x	D2 Technologies
G.729A Decoder	C54x	Signals + Software
G.729A Decoder	C55x	DSP Wizard
G.729A Decoder	C62x	RadiSys Corp.
G.729A Decoder	C62x	Signals + Software
G.729A Encoder	C54x	Signals + Software
G.729A Encoder	C55x	DSP Wizard
G.729A Encoder	C62x	RadiSys Corp.
G.729A Encoder	C62x	Signals + Software
G.729A Encoder/Decoder	C54x	Adaptive Digital Technologies
G.729A Encoder/Decoder	C54x	GAO Research Inc.
G.729AB	C62x	CuTe Solution
G.729AB Decoder	C54x	D2 Technologies
G.729AB Decoder	C54x	HelloSoft
G.729AB Decoder	C54x	Signals + Software
G.729AB Decoder	C55x	DSP Wizard
G.729AB Decoder	C55x	HelloSoft
G.729AB Decoder	C62x	RadiSys Corp.
G.729AB Decoder	C62x	Signals + Software
G.729AB Encoder	C54x	D2 Technologies
G.729AB Encoder	C54x	HelloSoft
G.729AB Encoder	C54x	Signals + Software
G.729AB Encoder	C55x	DSP Wizard
G.729AB Encoder	C55x	HelloSoft
G.729AB Encoder	C62x	RadiSys Corp.
G.729AB Encoder	C62x	Signals + Software
G.729AB Encoder	C62x	SIAL
G.729AB Encoder	C62x	SURF Communication Solns.
G.729AB Encoder	C62x	Adaptive Digital Technologies
G.729AB Encoder	C62x	GAO Research Inc.
G.729AB Encoder	C62x	CuTe Solution
G.729AB Decoder	C54x	D2 Technologies
G.729AB Decoder	C54x	HelloSoft
G.729AB Decoder	C54x	Signals + Software
G.729AB Decoder	C55x	DSP Wizard
G.729AB Decoder	C55x	HelloSoft
G.729AB Decoder	C62x	RadiSys Corp.
G.729AB Decoder	C62x	Signals + Software
G.729AB Decoder	C62x	SIAL
G.729AB Decoder	C62x	SURF Communication Solns.
G.729AB Decoder	C62x	Adaptive Digital Technologies
G.729AB Decoder	C62x	GAO Research Inc.
G.729AB Decoder	C62x	CuTe Solution
G.729AB Encoder	C54x	D2 Technologies
G.729AB Encoder	C54x	HelloSoft
G.729AB Encoder	C54x	Signals + Software
G.729AB Encoder	C55x	DSP Wizard
G.729AB Encoder	C55x	HelloSoft
G.729AB Encoder	C62x	RadiSys Corp.
G.729AB Encoder	C62x	Signals + Software
G.729AB Encoder	C62x	SIAL
G.729AB Encoder	C62x	SURF Communication Solns.
G.729AB Encoder	C62x	Adaptive Digital Technologies
G.729AB Encoder	C62x	GAO Research Inc.
G.729AB Encoder	C62x	CuTe Solution
G.729AB Decoder	C54x	SPIRIT CORP.
G.729AB Decoder	C55x	SPIRIT CORP.
G.729AB Decoder	C62x	SIAL
G.729AB Decoder	C62x	SURF Communication Solns.
G.729AB Decoder	C62x	Adaptive Digital Technologies
G.729AB Decoder	C62x	GAO Research Inc.
G.729AB Decoder	C62x	CuTe Solution
G.729B Decoder	C54x	D2 Technologies
G.729B Decoder	C54x	HelloSoft
G.729B Decoder	C54x	Signals + Software
G.729B Decoder	C55x	DSP Wizard
G.729B Decoder	C62x	Signals + Software
G.729B Encoder	C54x	D2 Technologies
G.729B Encoder	C54x	HelloSoft
G.729B Encoder	C54x	Signals + Software

## eXpressDSP™-Compliant Third-Party Algorithms

### VOCODERS (CONTINUED)

Compliant Algorithm	Generation	Third-Party Vendor
G.729B Encoder	C55x	DSP Wizard
G.729B Encoder	C62x	Signals + Software
G.729B Encoder/Decoder	C54x	Adaptive Digital Technologies
G.729E Decoder	C54x	D2 Technologies
G.729E Encoder	C54x	D2 Technologies
G.723.1 Decoder	C62x	SURF Communication Solns.
G.723.1 Encoder	C62x	SURF Communication Solns.
IPCM Wideband	C54x	Global IP Sound AB
Voice Activity Detector	C54x	Ingenient Technologies
Voice Activity Detector	C62x	Ingenient Technologies
Voice Activity Detector	C64x	Ingenient Technologies

### WIRELESS

Compliant Algorithm	Generation	Third-Party Vendor
G.723.1/GSM-AMR Transcoder	C62x	Dilithium Networks
GSM AMR Decoder	C55x	HelloSoft
GSM AMR Decoder	C55x	Emuzed
GSM AMR Encoder	C55x	Emuzed
GSM AMR Encoder	C55x	HelloSoft
GSM-AMR/G.723.1 Transcoder	C62x	Dilithium Networks
GSM AMR Wideband Decoder	C55x	Emuzed
GSM AMR Wideband Encoder	C55x	Emuzed
GSM Enhanced Full-Rate Decoder	C54x	SIAL
GSM Enhanced Full-Rate Decoder	C62x	Signals + Software
GSM Enhanced Full-Rate Encoder	C54x	SIAL
GSM Enhanced Full-Rate Encoder	C62x	Signals + Software
GSM Full-Rate Decoder	C54x	Bayer DSP
GSM Full-Rate Decoder	C55x	Bayer DSP
GSM Full-Rate Decoder	C62x	Signals + Software
GSM Full-Rate Encoder	C54x	Bayer DSP
GSM Full-Rate Encoder	C55x	Bayer DSP
GSM Full-Rate Encoder	C62x	Signals + Software

### View Updated eXpressDSP-Compliant Third Party Algorithm List

The eXpressDSP-compliant Third Party algorithm list is updated monthly highlighting the newest third-party algorithms. See the most recent list at [www.ti.com/algorithms](http://www.ti.com/algorithms)

## eXpressDSP™-Compliant Third-Party Plug-Ins



Get the most updated information on eXpressDSP-compliant plug-ins at: [www.ti.com/plug-ins](http://www.ti.com/plug-ins)

### What is a Plug-In?

A plug-in is a software application that integrates with, customizes or extends the Code Composer Studio™ IDE with additional specialized functionality. Plug-ins provide a wide range of tools for every step of the development process to assist you to develop DSP applications quickly and effectively. This allows you to focus on developing features to differentiate your TI DSP-based product and release more robust products to market faster.

### How Plug-Ins Speed Development

Using standard tools, the development cycle consists of four stages: application design, code & build, debug, and analyze & tune. Specialized plug-ins can be integrated into each step of the development flow to decrease the overall time to product deployment. By using third-party plug-ins during the application design and code & build stages, you can build your application fast. Plug-ins used during the debug and analyze & tune stages make your application perfect. Plug-ins also enable you to use familiar tools with TI DSPs. This reduces the learning curve and enables you to focus on innovation.

Some examples of plug-in types are as follows.

- **Application Generation** – generate C code or a complete application from a block diagram tool or generate a simple

project skeleton for a development board.

- **External Text Editors** – enable developers to use an editor they already know.
- **Filter Design** – insert filter code, integrate modified filter parameters into projects and analyze digital filters.
- **Hardware Support** – assist with installation, setup, configuration and diagnostics of development boards.
- **System Simulation** – concurrently simulate both hardware and software portions of a system.
- **Code Analysis** – provide code coverage, automate code testing and analyze code structures and arrays.
- **Code Testing** – generate test stubs and system testing utilities.
- **Real-Time Analysis** – provide controls to TI's DSP/BIOS™ kernel or other third party operating systems for dynamic execution profilers that can show developers exactly where they are spending their CPU cycles.
- **Real-Time Instrumentation** – visually analyze data from target using RTDX™.
- **Run-Time Error Analysis** – detect memory leaks, array index errors, function parameters, return errors and data errors.

### eXpressDSP-Compliant Plug-Ins Available Today Include:

Name	Contact	Stage of the Development Cycle				TI DSP Platform		
		Application Design	Code & Build	Debug	Analyze & Tune	C6000™	C5000™	C2000™
Borland Corporation CodeWright	<a href="http://www.borland.com">www.borland.com</a>		X			X	X	
Elanix SystemView's Real-Time DSP Architect	<a href="http://www.elanix.com">www.elanix.com</a>	X	X			X	X	
National Instruments / Hyperception, Inc. eXpressDSP™ Component Wizard LabView DSP Test Integration Toolkit for TI DSP Visual Application Builder	<a href="http://www.ni.com">www.ni.com</a>	X		X	X	X	X	X
Pentek, Inc. SwiftNet Debug Manager SwiftNet Project Manager	<a href="http://www.pentek.com">www.pentek.com</a>	X				X		
Rational Software Corporation Rational Test Real-Time Plug-In	<a href="http://www.rational.com">www.rational.com</a>	X				X		
Technosoft Control Panel Global Variable Visualizer for Digital Motor Controllers (DMCs) Graphical I/O Registers Viewer for DMCs Data Logger Tool for DMCs Reference Generator for Motion Reference for DMCs	<a href="http://www.technosoft.ch">www.technosoft.ch</a>			X	X	X		X
The MathWorks, Inc. Filter Design Toolbox MATLAB® Link for Code Composer Studio (CCStudio) IDE SIMULINK® Embedded Target for C6000™ DSP Platform	<a href="http://www.mathworks.com">www.mathworks.com</a>	X	X	X	X	X	X	X
Vector Software, Inc. VectorCAST for CCStudio	<a href="http://www.vectors.com">www.vectors.com</a>	X	X	X	X	X	X	X
Visual Solutions Incorporated VisSim™-CCStudio Plug-In	<a href="http://www.vissim.com">www.vissim.com</a>	X	X			X		X

X – supported



## Support

### DSP Support

Design Answers at Your Fingertips

Get additional information on training, technical documentation and more at: [www.ti.com/dspsupport](http://www.ti.com/dspsupport)

### TI DSP Support

Get to market easily and quickly by leveraging TI DSP support. Customers large and small can access fast and accurate support for their DSP applications. From your personal, on-line "24/7" DSP KnowledgeBase to technical documentation, TI offers the technical support you need when YOU need it. On-line training, webcasts, workshops and the TI Developer Conference provide an array of convenient support choices.

### TI DSP Training Options



#### TI Developer Conference 2005, North America Series

February 15–17, 2005  
Hilton Americas Hotel  
Houston, Texas

#### Create the Next Leading-Edge Signal Processing Design

The TI Developer Conference provides networking opportunities with industry and TI experts, must-have technical training and peer-to-peer interaction for embedded designers. Both novice and expert-level designers can improve design efficiency by attending this three-day conference. Tracks include:

- Audio
- Communications
- Control
- Education
- Systems
- Tools
- Video

Register today at [www.ti.com/tidc05](http://www.ti.com/tidc05)

### Europe Series

In one day, in one place, find the signal processing solution you need for your application.

May 25 – Milan, Italy  
May 30 – Tel Aviv, Israel

For more information visit

[www.ti.com/europe/devcon](http://www.ti.com/europe/devcon)

### Asia Series

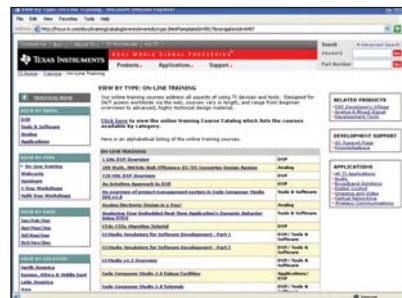
Get in-depth, technical information and interact with TI and industry experts.

April 18–19 – Beijing  
April 20 – Shanghai  
April 22 – Shenzhen  
April 26 – Taipei  
April 28 – Seoul

For more information visit  
[www.ti.com/tidc](http://www.ti.com/tidc)

### Free On-Line Training

Learn more about how to design your digital signal processing application with self-paced on-line training covering DSP applications, TMS320™ DSPs and easy-to-use software development tools.



Dozens of courses such as "1-GHz DSP Overview" to "Reference Frameworks for eXpressDSP™ Software" are available today and run from 30 minutes to two hours each.

[www.ti.com/onlinetraining](http://www.ti.com/onlinetraining)

### DSP Webcasts

TI conducts free DSP webcasts to address topics most critical to designers.



A typical webcast includes a presentation followed by a question & answer session with the technical engineering presenter specializing in the topic. After the live event, DSP webcasts are available via the archive library.

[www.ti.com/webcastarchive](http://www.ti.com/webcastarchive)





## Support

### Real World Answers – Ask the Experts

System-Level Expertise with the Click of a Mouse

Get answers to your design questions at: [www.ti.com/realworldanswers](http://www.ti.com/realworldanswers)

Save valuable design time and get the answers you need for your current design with the click of a mouse. Texas Instruments offers system-level expertise in a variety of application areas such as: control, telecom, biometrics, video and imaging and more.

Visit [www.ti.com/realworldanswers](http://www.ti.com/realworldanswers) to find helpful information, frequently asked questions and technical documentation for your specific application. Or, "Ask the Expert" and e-mail your design questions. An expert from TI will respond directly back to you.

#### Control

 TI DSP embedded controllers can help you design power tools with more reliable sensorless control, white goods with higher energy-efficient motors or multi-phase industrial motors with higher resolution and precision. TI's TMS320C2000™ DSP platform provides the ultimate combination of MCU peripheral integration, C efficiency and ease-of-use with the performance of TI DSPs. See how TI DSP embedded controllers can provide your design with more features, better feedback and precision, and reduce costs.

Answers to popular control questions can be viewed at

[www.ti.com/controlanswers](http://www.ti.com/controlanswers)

Or ask the control expert your question at [controlanswers@list.ti.com](mailto:controlanswers@list.ti.com).

#### Telecom

 TI offers customized telephony products to allow you to get to market faster and easier when developing client-side telephony, embedded modem, remote data collection, Internet connectivity, telephony coprocessing or voiceband processing applications. Using TI's single-source telephony solutions, designers can easily expand product capabilities and feature sets for

telecom applications, as well as customize, adapt and scale the solution to suit particular requirements, allowing designers to focus on end-product differentiation.

Answers to popular telephony questions can be viewed at

[www.ti.com/telephonyanswers](http://www.ti.com/telephonyanswers)

Or ask the telecom expert your question at [telephonyanswers@list.ti.com](mailto:telephonyanswers@list.ti.com).

#### Security

 With unmatched systems expertise, TI delivers a broad product offering to the security industry, resulting in reduced costs of development and faster time-to-market for customers building security products incorporating biometrics and video surveillance. TI TMS320C6000™ DSPs are used to compress the image in a variety of capable formats, as well as offer the ability to use intelligent image analysis functions and different types of networking protocol support.

Answers to popular security questions can be viewed at

[www.ti.com/securityanswers](http://www.ti.com/securityanswers)

Or ask the security expert your question at [securityanswers@list.ti.com](mailto:securityanswers@list.ti.com).

#### Video and Imaging

 From portable to plugged applications, TI offers DSP and Analog solutions to fit your video, imaging or multimedia systems design application. TI can help accelerate your design with smarter image processing, more functionality and flexibility that differentiates your product in the marketplace.

TI video and imaging silicon solutions include TI's new TMS320DM64x™ digital media processors, C6000™ and TMS320C5000™ DSPs and OMAP59xx processors. Plus software, developer kits, systems expertise and support are available to accommodate all your needs – no matter what imaging and/or video end equipment is being developed.

Answers to popular video and imaging questions can be viewed at

[www.ti.com/videoimaginganswers](http://www.ti.com/videoimaginganswers)

Or ask the video and imaging expert your question at

[videoimaginganswers@list.ti.com](mailto:videoimaginganswers@list.ti.com).



## Training Resources

On-Line Training, Webcast Library, One-Day Workshops, Multi-Day Workshops

Get updated information on TI training resources at: [www.ti.com/training](http://www.ti.com/training)

### On-Line Training

A variety of free on-line training courses is available and addresses all aspects of using TI devices and tools. Designed for worldwide access 24/7, these courses vary in length and range from beginner overviews to advanced, highly technical design information. Learn more about

how to design your signal processing application with self-paced on-line training courses including:

- DSP basics
- DSP applications
- Easy-to-use software development tools

- DSP programming tips and tricks
- TMS320C6000™, TMS320C5000™ and TMS320C2000™ DSP platforms
- Analog
- Power supplies

For a complete list of available courses, visit [www.ti.com/onlinetraining](http://www.ti.com/onlinetraining)

## One-Day Workshops

One-day workshops are designed to offer product or technology knowledge and more advanced information about a particular category of devices. These workshops include a significant "hands-on" section and are ideal introductions to get started with DSP. A list of available courses and schedule information can be found at [www.ti.com/1dayworkshops](http://www.ti.com/1dayworkshops)

### TMS320C6416/C6713 DSK One-Day Workshop

- Introduction to TMS320C6000™ DSPs and Code Composer Studio™ IDE
- C6000™ DSP peripherals
- Using the C6000 DSP system tools and software
- Optimizing C6000 DSP code

### TMS320C5510 DSK One-Day Workshop

- TMS320C5000™ DSP overview
- TMS320C55x™ architecture and peripherals
- Introduction to Code Composer Studio IDE
- Using the C5510 DSP Starter Kit (DSK)
- Use the Chip Support Library to setup and program peripherals
- Analyze and use power-reduction techniques

- Evaluate methods to maximize performance
- Use DSP/BIOS™ kernel and RTA (real-time analysis tools) to build, analyze and debug a system
- Run labs/demos using common real-time applications on hardware (C5510 DSK)

### TMS320F2812 eZdsp™ One-Day Workshop

- Basic DSP controller implementation
- TMS320F2812 DSP architecture
- How to use PC-based development tools – F2812 eZdsp and Code Composer Studio 2.12 system design

### Video and Audio Applications Design Hands-On Workshop Based on TMS320DM642 Digital Media Processor

- Getting started on a new video and audio design
- Hardware platform based on DM642 digital media processor
- MPEG-4 technology
- ADPCM audio compression technology
- Digital video security solution on DM642 – video security application example

### Digital Motor Control One-Day Workshop

- Overview of the synchronous and asynchronous machines
- Compares the field-oriented control with the standard scalar control techniques
- Receive the latest technology and product updates to support your future design
- Learn how the use of DSP processors can lead to the most effective control of your motor

### DSP/BIOS™ OS One-Day Workshop

- Key elements of a real-time DSP system
- Practical designing and problem solving in multithreaded applications
- Minimizing overhead
- Real-time analysis and debug
- Real-time scheduling and resource management
- Host and target communications



## Support

### Multi-Day Workshops

Multi-day workshops are for engineers who need to sharpen their design and development skills. These workshops include significant “hands-on” labs emphasizing the demonstration and application of techniques and skills. TI workshops are highly beneficial in helping developers implement their DSP designs quickly. A list of available courses and schedule can be found at

[www.ti.com/multidayworkshops](http://www.ti.com/multidayworkshops)

#### TMS320C6000™ DSP Integration Workshop

- Use Code Composer Studio™ IDE
- Design a real-time double-buffered system
- TMS320C6711 Design Starter Kit (DSK)
- DSP/BIOS™ kernel
- Debugging with real-time analysis
- Set up peripherals using the Chip Support Library
- Discuss the McBSP serial ports multi-channel features
- Use the EDMA advanced features (auto-initialization, interrupt synchronization)
- C6000™ DSP system memory management
- C6000 DSP cache operation
- Design your DSP system to allow code/data overlays in memory
- Evaluate and use C6000 DSP boot loader
- Setting up a bootable image in Flash ROM
- Program the DSK on-board Flash memory

#### C6000 DSP Optimization Workshop

- C6000 DSP platform CPU architecture
- C6000 DSP platform CPU pipeline
- Building Code Composer Studio projects
- Exploring C6000 DSP compiler build options
- Writing efficient C code

- Writing optimized standard and linear assembly code
- Mixing C and Assembly language
- Software pipelining techniques
- Numerical issues with fixed-point processors
- Basic C6000 DSP system memory management
- How caches work and optimizing their usage

#### OMAP™ Software Workshop

- Aspects of an OMAP solution
- Overview of the OMAP architecture
- Overview of the OMAP software environment DSP/BIOS kernel bridge
- ARM “gateway” coding techniques
- DSP “node” coding techniques
- TMS320™ DSP Algorithm Standard concepts and authoring
- Advanced bridge programming concepts

#### TMS320C55x™ DSP Integration Workshop

- Use Code Composer Studio IDE
- Design a real-time double-buffered, channel-sorted system
- TMS320C5510 DSP Starter Kit (DSK)
- DSP/BIOS kernel
- Debugging with real-time analysis
- Set up peripherals using the Chip Support Library
- Use some of the McBSP serial ports multi-channel features
- Use the DMA auto-initialization feature
- Use eXpressDSP™-compliant algorithms in an application
- Optimize code and memory for the C55x™ DSPs
- C55x DSP system memory management
- HEX500 system memory management
- Use VC5416 boot loader
- Program the DSK on-board Flash memory

#### TMS320C54x™ DSP Integration

##### Workshop

- Utilize Code Composer Studio IDE
- Design a real-time, double-buffered, channel-sorted system
- TMS320VC5416 DSP Starter Kit (DSK)
- DSP/BIOS kernel
- Debugging with real-time analysis
- Set up peripherals using the Chip Support Library
- Use some of the McBSP serial ports multi-channel features
- Use the DMA auto-initialization feature
- Use eXpressDSP-compliant algorithms in an application
- Optimize code and memory for the C54x™ DSP
- C54x DSP system memory management
- HEX500 system memory management
- Use VC5416 boot loader
- Program the DSK on-board Flash memory

#### TMS320C28x™ DSP Workshop

- Evaluate C28x™ DSP ability to meet your system requirements
- Compare/contrast C28x DSP to other solutions you have used or evaluated
- Use development tools to compile, optimize, assemble, link, debug and benchmark code
- Demonstrate a working knowledge of the C28x DSP functional modules
- Demonstrate a working knowledge of the basic operations for the C28x DSP
- Understand where to go to get more information
- Have a full working knowledge of your take-home eZdsp™ board



## Multi-Day Workshops (Continued)

### TMS320C24x™ DSP Workshop

- C24x™ DSP architecture and instruction set
- Use of PC-based development tools
- Memory and I/O usage
- Algorithm development
- Basic DSP controller implementation
- Binary arithmetic, scaling, difference equations
- Hardware interface issues

### DSP/BIOS™ Kernel One-Day Workshop

- Define a real-time system design and its software design challenges
- Apply software development tools in developing a system:

- Generating and loading software for a specific target
- Debugging software and visualizing data using breakpoints
- Visualizing software performance and data during execution using DSP/BIOS kernel
- Integrate system and application software into a real-time design:
  - Interfacing to and configuring DSP/BIOS kernel
  - Synchronizing events and access to shared data structures using DSP/BIOS kernel
  - Communicating between processes and with peripheral devices using DSP/BIOS kernel

- Analyze and optimize software to meet real-time requirements
  - Analyzing real-time performance of software using DSP/BIOS kernel
  - Calculating and optimizing I/O buffering
  - Optimizing the use of program and data memory

### Registration

To register for these workshops, please visit

[www.ti.com/multidayworkshops](http://www.ti.com/multidayworkshops)

## TI DSP Webcast Library

The library contains a variety of webcasts ranging from technical "How-Tos" to systems solution presentations and product overviews, which address current topics most critical to designers. Designed for 24/7 access worldwide via the Web, these webcasts typically last one hour. Each includes a presentation followed by a live Question & Answer session with the technical engineering presenter specializing in the topic. To access the library, visit [www.ti.com/webcasts](http://www.ti.com/webcasts)

### DSP Webcasts

- Design and Implementation of Video Applications on TI DSP With Simulink®

- Considerations/Tradeoffs When Choosing a Floating-Point DSP
- The Possibilities are Limitless with 1-GHz DSP Technology from Texas Instruments
- So Many Architectures, So Little Time: Difficult Choices for Signal Processing
- Easy Peripheral Programming with TI's Chip Support Library
- Don't Compromise—DSP Controllers Solve Embedded Control Design Challenges
- Debugging DSP Systems with TI JTAG Emulation
- Maximizing Data Transfer Efficiency with C5000™ DMA Controller

- Getting Started with Code Composer Studio™ IDE Version 2.0
- Utilizing the Two-Level Cache on the TMS320C62x™ / TMS320C67x™ / TMS320C64x™ DSPs in your DSP System
- Flash Programming for TMS320LF240x DSP Digital Control Systems
- Debug C24x DSP Digital Control Design with Real-Time Monitoring
- New C64x™ DSPs Revolutionize 3G Wireless
- Flexible System Interfacing with McBSP
- Manage Code Size vs. Code Speed Tradeoffs with Profile-Based Compiler

***Notes***



***Notes***



Texas Instruments DSP device nomenclature includes a Prefix (signifying the device qualification status), the Device Family number (i.e., 320 or 32 for TI DSPs), a Technology symbol, the Device number (typically three to five alpha-numeric characters), a two or three character Package Type code, an optional

Temperature Range character, and the Device Speed Designation. Other variations do exist on a limited basis. See the specific device data sheet for additional information on device nomenclature for that device.

For the most updated information, visit [www.dspvillage.com](http://www.dspvillage.com)

## Typical DSP Device Nomenclature

	TMS	320	C	6416	T	GDK	( )	600
<b>Prefix</b>								
TMX	= Experimental device							
TMP	= Prototype device							
TMS	= Qualified device							
SMJ	= MIL-PRF-38535, QML							
SM	= High Rel (non-38535)							
OMAP	= OMAP							
P	= Experimental device (OMAP)							
<b>Device Family</b>								
32 or 320	= TMS320™ DSP family							
<b>Technology</b>								
C	= CMOS							
DM	= Digital media							
E	= CMOS EPROM							
F	= CMOS Flash EEPROM							
LC	= Low-voltage CMOS (3.3 V)							
LF	= Flash EEPROM (3.3 V)							
UC	= Low-voltage CMOS [3 V (1.8-V core)]							
VC	= Low-voltage CMOS [3 V (2.5-V core)]							
<b>Device</b>								
<b>C6000 DSPs</b>			<b>C5000 DSPs</b>			<b>C2000 DSPs</b>		
6201	6701	5401	5420		240	2801		
6202B	6711D	5402	5421		241	2806		
6203B	6712D	5402A	5501		242	2808		
6204	6713B	5404	5502		243	2810		
6205	640	5405	5503		2401A	2811		
6211B	641	5407	5507		2402A	2812		
6410	642	5409	5509A		2403A			
6412	643	5409A	5510A		2404A			
6413		5410	5910		2406A			
6414/6414T		5410A	5912		2407A			
6415/6415T		5416						
6416/6416T		54CST						
6418								

### Device Speed Designation

#### C6000™ DSPs

150 (150 MHz)	500 (500 MHz)
167 (167 MHz)	600 (600 MHz)
200 (200 MHz)	720 (720 MHz)
233 (233 MHz)	6 (600 MHz)
250 (250 MHz)	7 (720 MHz)
300 (300 MHz)	8 (850 MHz)
400 (400 MHz)	1 (1 GHz)

#### C5000™ DSPs

50 (50 MHz)	16 (160 MHz)
80 (80 MHz)	200 (200 MHz)
100 (100 MHz)	300 (300 MHz)
12 (120 MHz)	

### Temperature Range

Blank = 0°C to 90°C, commercial temperature, default for C6000 DSPs

Blank = -40°C to 100°C, default for C54x™ DSPs

A = -40°C to 105°C, extended temperature (C6000 DSPs)

A = -40°C to 85°C, extended temperature (C2000™ DSPs)

H = 0°C to 50°C

L = 0°C to 70°C

M = -55°C to 125°C

S = -55°C to 125°C (C5000 DSPs)

S = -40°C to 125°C (C2000 DSPs)

### Package Type

FN = 38-lead PLCC

GNZ = 352-/548-pin plastic BGA (27 mm<sup>2</sup>)

GDK = 548-pin plastic BGA (23 mm<sup>2</sup>)

GQW = 143-pin MicroStar Jr. BGA (7 mm<sup>2</sup>)

GDP = 272-pin plastic BGA (27 mm<sup>2</sup>)

GTS = 288-pin plastic BGA (23 mm<sup>2</sup>)

GDY = 289-pin MicroStar BGA™ (19 mm<sup>2</sup>)

GZG = 289-pin MicroStar BGA (12 mm<sup>2</sup>)

GEL = 181-pin PGA

GZZ = 201-pin MicroStar BGA (15 mm<sup>2</sup>)

GFN = 256-pin plastic BGA (27 mm<sup>2</sup>)

PG = 64-pin PQFP (14 × 20 mm)

GGU = 144-/169-pin MicroStar BGA (12 mm<sup>2</sup>)

PAG = 64-pin TQFP (10 mm<sup>2</sup>)

GGW = 176-/240-pin MicroStar BGA (15 mm<sup>2</sup>)

PBK = 128-pin LQFP (14 mm<sup>2</sup>)

GHH = 179-pin MicroStar BGA (12 mm<sup>2</sup>)

PCM = 144-pin PQFP (28 mm<sup>2</sup>)

GHK = 257-/288-pin MicroStar BGA (16 mm<sup>2</sup>)

PGE = 144-pin LQFP (20 mm<sup>2</sup>)

GJC = 352-pin plastic BGA (35 mm<sup>2</sup>)

PGF = 176-pin LQFP (24 mm<sup>2</sup>)

GJL = 352-pin plastic BGA (27 mm<sup>2</sup>)

PQ = 132-pin PQFP (24.13 × 27.44 mm)

GLS = 384-pin plastic BGA (18 mm<sup>2</sup>)

PYP = 208-pin PowerPAD™ plastic QFP (28 mm<sup>2</sup>)

GLW = 340-pin plastic BGA (18 mm<sup>2</sup>)

PZ = 100-pin LQFP (14 mm<sup>2</sup>)

GLZ = 532-pin plastic BGA (23 mm<sup>2</sup>)

VF = 32-pin LQFP (7 mm<sup>2</sup>)

GNY = 284-pin plastic BGA (18 mm<sup>2</sup>)

ZDY = 289-pin MicroStar BGA (19 mm<sup>2</sup>)

ZZG = 289-pin MicroStar BGA (12 mm<sup>2</sup>)

For the *actual* device-specific part numbers, see the Product Specification Guides in this document.



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